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Leveraging Quantum Sensors for Dark Matter Detection

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Recent measurements have demonstrated that superconducting qubit decoherence is affected by radiation. As a result, many groups around the world are working to better understand the relationship between different types of radiation and qubit response. This crucial to quantum error correction because radiation can cause correlated loss of information across multiple qubits on a chip, defeating error correction algorithms. Additionally, the fundamental energy scale at which superconducting qubits operate may enable their development as meV-scale detectors for HEP applications, such as the direct detection of dark matter. At Fermilab, we have two world-class underground facilities which are already being used to study this problem: NEXUS and QUIET. I will present on results from operating superconducting qubits in each of these facilities, and the potential implications towards utilizing qubits as sensors for a novel dark matter detector.

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