



Contribution ID: 16

Type: **not specified**

Cryogenic Platforms at Fermilab: Recent Results and Outlook

Thursday, 22 August 2024 10:30 (30 minutes)

The Cosmic Quantum group at Fermilab operates three cryogenic facilities dedicated to the development and calibration of superconducting low-threshold detectors and qubits. One of which (LOUD) is located at the surface, while the other two (NEXUS and QUIET) are located 100 m underground enabling low-background device characterization and rare event searches. Recently, we have demonstrated world-leading resolution in the quasiparticle channel for kinetic inductance phonon-mediated detectors as well as the lowest rate of spatially- and temporally- correlated errors (“charge jumps”) in superconducting qubit chips. We have additionally made significant progress in expanding the suite of tools for simulating signal production and readout of these devices. In this talk, I will review these recent results, discuss some nascent projects focused on enhancing sensitivity of these detectors to sub-GeV dark matter, and highlight activities in these facilities over the next year.

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