

New Perspectives



Contribution ID: 60

Type: **not specified**

Superconducting qubit studies at NEXUS

Wednesday, June 22, 2022 9:00 AM (15 minutes)

Superconducting qubits are of interest for the development of quantum computers and for quantum sensing in experiments such as dark matter searches. For both applications, it is crucial to understand qubit errors and the resulting performance limitations. Recent studies of charge noise and relaxation errors in a multiqubit device found significant spatial correlation of errors across the device. Such correlations are not compatible with current error-correcting algorithms for large arrays of qubits. The suspected cause of these errors is energy deposition from ionizing radiation. To test this hypothesis, we are studying the correlated charge noise of a multiqubit device in the NEXUS (Northwestern Experimental Underground Site) dilution fridge at Fermilab. The fridge is located underground in the MINOS tunnel and is equipped with lead shielding, reducing the backgrounds from both cosmic and lab-based sources of environmental radiation. This talk will provide a summary of the current status of our underground qubit experiments.

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Session Classification: Cosmic Physics