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Characterizing qubit decoherence deep underground at SNOLAB

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Although superconducting qubits have seen improvements in coherence times over the last decades, their performance remains orders of magnitude below that needed for a fully realizable quantum computer. A major limitation is driven by large populations of non-equilibrium quasiparticles in the qubits which can induce decoherence. These quasiparticles may originate when ionizing radiation, either from cosmic rays or the environment, break Cooper pairs in the superconducting circuitry. The Cryogenic Underground TEst Facility (CUTE) at SNOLAB, with 2 km of rock overburden, provides an ideal venue for testing these hypotheses. The QUTEbits Collaboration is a new collaboration between Chalmers University of Technology, the Institute for Quantum Computing at the University of Waterloo, and SNOLAB with the goal of studying the origin of this major decoherence mechanism. By operating the same set of transmon qubits both in surface facilities and underground at CUTE, their performance in different radiation environments can be compared. This talk will describe the QUTEbits project and summarize the results obtained so far.

Keyword-1

transmon

Keyword-2

coherence

Keyword-3

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