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Correlated and Uncorrelated Backgrounds and Noise Sources in Athermal Phonon Detectors and Other Low Temperature Detectors

Thursday, 9 November 2023 16:00 (20 minutes)

The performance of a variety of superconducting detectors including athermal phonon detectors and qubits is limited by spurious energy depositions, which create background events, noise, and otherwise degrade device performance. In athermal phonon detectors, at high event energies, these energy depositions appear as the zero charge component of the "Low Energy Excess." At lower event energies, these events contribute to excess shot noise in TESs and the "quasiparticle poisoning" problem in qubits. Here, we present evidence that these phenomena are linked, and that a single mechanism or set of mechanisms is responsible for observations over a wide range of energy scales. We show that the rate of these energy depositions scales similarly with time over a wide range of energies, and that the events are both phonon and non-phonon mediated. The slow relaxation of stress in detector materials is discussed as a likely source of these events. Resolving these excesses will be key to improving next generation light dark matter searches and developing advanced high energy resolution superconducting detectors.

Early Career

Yes

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