Contribution ID: **157** Type: **Parallel session talk**

Phonon and Quasiparticle Transport in Superconductors and novel materials

Wednesday 8 October 2025 11:15 (15 minutes)

Understanding phonon and charge propagation in superconducting devices is essential for low-threshold dark matter and neutrino searches. In this work, we extend G4CMP capabilities to model phonon propagation in novel superconducting materials, including Aluminum, Tantalum, and Niobium. Furthermore, we enable phonon–quasiparticle transport in the interface of superconducting thin film and the substrate and evaluate the performance of the devices. Finally, we investigate strategies to enhance phonon collection efficiency for various qubit designs.

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Session Classification: RDC 8 Quantum & Superconducting Sensors

Track Classification: RDC 8 Quantum & Superconducting Sensors