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C3Po1C-09 (moved from C1Po1A-06): Thermal modeling of low temperature devices

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It is critical to understand the thermal environment of superconducting electronics and supporting hardware for the circuitry to function as designed. We present a methodology to approximate thermal properties and capture the unique physics (i.e., acoustic and diffuse phonon transmission at boundaries and electron-phonon interactions) that occur in these systems. The methodology approximates thermal conductivity of materials using the Wiedemann Franz law, Debye theory of solids, and BCS theory. We utilize the outlined method to develop a fully 3D model in COMSOL Multiphysics and compare it to a simple 0D approximation, highlighting the value and accuracy of the simple model.

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