Abstract Submitted
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Thermal Properties of Metallic Nanowires: Modeling & Experiment[1] NENAD STOJANOVIC, JORDAN BERG, Texas Tech University, SANJEEVA MAITHRIPALA, University of Peradeniya, Sri Lanka, MARK HOLTZ, Texas Tech University — Effects such as surface and grain boundary scattering significantly influence electrical and thermal properties of nanoscale materials with important practical implications for current and future electronics and photonics. Conventional wisdom for metals holds that thermal transport is predominantly by electrons and transport by phonons is negligible. This assumption is used to justify the use of the Wiedemann-Franz law to infer thermal conductivity based on measurements of electrical resistivity. Recently experiments suggest a breakdown of the Wiedemann-Franz law at the nanoscale. This talk will examine the assumption that thermal transport by phonons can be neglected. The electrical resistivities and thermal conductivities of aluminum nanowires of various sizes are directly measured. These values are used in conjunction with the Boltzmann transport equation to conclude that the Wiedemann-Franz law describes the electronic component of thermal conductivity, but that the phonon term must also be considered. A novel experimental device is described for the direct thermal conductivity measurements.

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