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Thermal Conductivity of Quantum Wires with Surface Roughness SELMAN HERSHFIELD, KHANDKER MUTTALIB, Dept. of Physics, University of Florida — Quantum wires have been shown to have greatly reduced thermal conductivity compared to bulk systems because of the increased role of surface scattering. The lattice thermal conductance and conductivity is calculated in the harmonic approximation for a long quantum wire placed between two heat baths using the Landauer formula for phonons and a recursive Green function technique to compute the transmission probabilities. The width of the wires is varied in the transverse direction so as to have a root mean square value σ and correlation length L. As observed experimentally, we find that the thermal conductance is decreased with increasing σ and increased as L increases. The full scaling of the thermal conductance as a function of σ, L, the width and the length of the sample is discussed. The simulations are also compared to approximate techniques such as modeling the surfaces as having diffusive scattering.

Selman Hershfield
Dept. of Physics, University of Florida

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