

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Lattice thermal conductance of quantum wires with disorder

ERIK VYHMEISTER, Andrews University, SELMAN HERSHFIELD, University of Florida — We model the lattice thermal conductance in long quantum wires connected to two large heat baths at different temperatures in the harmonic approximation. The thermal conductance is computed with the Landauer formula for phonons, where it is related to the sum over all transmission probabilities for phonons through the wire. The net transmission probability is computed using a recursive Green function technique, which allows one to study long wires efficiently. We consider several different kinds of disorder to reduce the lattice thermal conductivity: periodic rectangular holes of varying sizes and shapes, periodic triangular holes, and narrow bands, averaged over randomness to account for variance in manufacturing. Depending on the model, the thermal conductance was reduced by 80 percent or more from the perfectly ordered wire case. Funded by NSF grant DMR-1461019.

Erik Vyhmeister
Andrews University

Date submitted: 04 Nov 2015

Electronic form version 1.4