Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Crossover behavior of the thermal conductance and Kramers' transition rate theory SUBIN SAHU, Department of Physics, Oregon State University, Corvallis OR, KIRILL VELIZHANIN, Theoretical Division, Las Alamos National Lab, Los Alamos NM, CHIH-CHUN CHIEN, School of Natural sciences, Unicersity of California, Merced CA, YONATAN DUBI, Department of Chemistry, Ben-Gurion University of Negev, Israel, MICHAEL ZWOLAK, National Institute of Standards and Technology, Gaithersburg MD — Heat transport plays opposing roles in nanotechnology, hindering the miniaturization of electronics on one hand and forming the core of novel heattronic devices on the other. Moreover, heat transport in one-dimensional nanostructures has become a central tool in studying the onset of Fourier's law of heat conduction, a yet unresolved puzzle in theoretical physics. We study the paradigmatic setting of heat transport in one-dimensional systems, a lattice coupled to two heat baths held at different temperatures. Using both numerical and analytical tools, we demonstrate that the heat conductance displays a crossover behavior as the coupling to the thermal reservoirs is tuned. We provide evidence that this behavior is universal by examining harmonic, anharmonic, and disordered systems, and discuss the origin of this effect using an analogy with Kramers' transition state theory for chemical reaction rates. This crossover behavior has important implications in the analysis of numerical results, and suggests a novel way to tune the conductance in nanoscale devices.

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Date submitted: 10 Nov 2014 Electronic form version 1.4