Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Platform for Measurement of Phonon Scattering from the Surface of Silicon Nanostructures. J. P. SULLIVAN, Sandia National Labs, T. A. FRIEDMANN, E. S. PIEKOS, S. L. SHINDE, J. R. WENDT — We've created a micro-platform for measuring thermal phonon surface scattering in single-crystal Si nanostructures, specifically specular-to-diffuse surface scattering in the long phonon mean-free-path regime. The platform consists of three suspended colinear monocrystalline Si islands with the center island resistively heated and connected to its neighbors by Si nanoligaments (one ligament straight, the other bent). The ligaments have a blade-like geometry with length, width, and depth of 1000 nm, 100 nm, and 2500 nm, respectively. Heat conducts from the center island across the ligaments in proportion to the ligament thermal conductance, which is lower for the bent ligament due to increased surface scattering. Monte Carlo simulations indicate that the heat flux differs between straight and bent nanoligaments by 10% for diffuse (rough surface) phonon reflection and by almost 40% for specular (smooth surface) reflection. Acknowledgment: DOE BES Div. of Mat. Sci. & Eng. and LDRD (Sandia is operated by Sandia Corp. for the US DOE's NNSA, contract DE-AC04-94AL85000).

J. P. Sullivan
Sandia National Labs

Date submitted: 21 Nov 2008 Electronic form version 1.4