Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Phonon Mapping in Flowing Equilibrium[1] J.P.C. RUFF, CHESS, Cornell University — When a material conducts heat, a modification of the phonon population occurs. The equilibrium Bose-Einstein distribution is perturbed towards flowing-equilibrium, for which the distribution function is not analytically known. Here I argue that the altered phonon population can be efficiently mapped over broad regions of reciprocal space, via diffuse x-ray scattering or time-of-flight neutron scattering, while a thermal gradient is applied across a single crystal sample. When compared to traditional transport measurements, this technique offers a superior, information-rich new perspective on lattice thermal conductivity, wherein the band and momentum dependences of the phonon thermal current are directly resolved. The proposed method is benchmarked using x-ray thermal diffuse scattering measurements of single crystal diamond under transport conditions.

[1]CHESS is supported by the NSF & NIH/NIGMS via NSF award DMR-1332208

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Date submitted: 14 Nov 2014 Electronic form version 1.4