

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

On The Solenoidal Heat Flux in Quasi-Ballistic Thermal Conduction¹ ASHOK RAMU, JOHN BOWERS, UC Santa Barbara — The Boltzmann transport equation for phonons is recast directly in terms of the heat-flux by means of iteration followed by truncation at the second order in the spherical harmonic expansion of the distribution function. This procedure displays the heat-flux in an explicitly coordinate-invariant form, and leads to a natural decomposition into two components, namely the solenoidal component in addition to the usual irrotational component. The solenoidal heat-flux is explicitly shown to arise in a right-circular cylinder when the transport is in the quasi-ballistic regime. These findings are important in the context of phonon resonators that utilize the strong quasi-ballistic thermal transport reported recently in silicon membranes at room temperature. Effects due to circulating heat fluxes are noted in the effective thermal conductivity of silicon discs.

¹This work was funded by the National Science Foundation, USA under project number CMMI-1363207.

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Date submitted: 04 Nov 2015

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