

Abstract Submitted
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Energy loss of the electron system in individual single-walled carbon nanotubes¹ DANIEL SANTAVICCA, JOEL CHUDOW, DANIEL PROBER, Yale University, MENINDER PUREWAL, PHILIP KIM, Columbia University — We characterize the energy loss of the non-equilibrium electron system in individual metallic single-walled carbon nanotubes at low temperature. Using Johnson noise thermometry, we demonstrate that, for a nanotube with ohmic contacts, the dc resistance at finite bias current directly reflects the average electron temperature. This enables a straightforward determination of the thermal conductance associated with cooling of the nanotube electron system. In analyzing the temperature- and length-dependence of the thermal conductance, we consider contributions from acoustic phonon emission, optical phonon emission, and hot electron outdiffusion [1]. In the same sample, we also characterize the radio frequency heterodyne response. Distinct responses are seen from bolometric detection and from the electrical non-linearity due to non-ohmic contacts.

[1] D.F. Santavicca, J.D. Chudow, D.E. Prober, M.S. Purewal, and P. Kim, Nano Lett. 10, 4538 (2010).

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