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Thermal Imaging of Electrically-Heated Carbon Nanotubes using Raman Spectroscopy SCOTT HSIEH, VIKRAM DESHPANDE, California Institute of Technology, ADAM BUSHMAKER, STEVE CRONIN, University of Southern California, MARC BOCKRATH, California Institute of Technology —
Suspended carbon nanotubes have been known to exhibit striking negative differential conductance under high bias voltages[1]. To better probe the physics underlying this phenomenon, we have recently developed techniques to measure Raman spectra simultaneously with electrical transport, resulting in the direct observation of mode selective electron-phonon coupling[2]. Using similar techniques, we present spatially resolved data taken from long, suspended, and electrically contacted individual carbon nanotubes. Along with electrical transport, Raman spectra are taken at several points along the spatial coordinate, creating a spatial map of the Raman-active phonon populations and the lattice temperature profile. We use a finite element simulation to corroborate our data with a Landauer model and extract numerical values for key scattering and relaxation rate parameters and thermal contact resistances. This use of Raman spectroscopy constitutes a novel non-contact technique for probing local thermal data in nanostructures.
[1] Pop *et al., Phys. Rev. Lett.* (2005).
[2] Bushmaker *et al., Nano Lett.* (2007).

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