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Probing Non-equilibrium Phonon Dynamics in Carbon Nanotubes by Time-Resolved Raman Spectroscopy DAOHUA SONG, FENG WANG, TONY F. HEINZ, Columbia University — In this paper we present a direct determination by femtosecond pump-probe laser spectroscopy of the lifetime of zone-center optical phonons in semiconducting single-walled carbon nanotubes. The non-equilibrium phonon population was created by the rapid relaxation following ultrafast optical excitation of the E_{22} transition of a suspension of isolated HipCO nanotubes. As a probe of the phonon population, we made use of antiStokes Raman scattering from G mode. From the variation of the Raman signal with pump-probe delay, we deduced a phonon lifetime around 1 ps. The relation between the measured population lifetime and Raman linewidth will be considered, as will be the implication of this result for the existence of non-equilibrium phonon population in nanotubes carrying high current densities.

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