Abstract Submitted
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Terahertz Detection in an Individual Single-Walled Carbon Nanotube[1] JOEL CHUDOW, DANIEL SANTAVICCA, Dept. of Applied Physics, Yale University, CHRIS MCKITTERICK, Dept. of Physics, Yale University, LUIGI FRUNZIO, Dept. of Applied Physics, Yale University, DANIEL PROBER, Dept. of Applied Physics and Physics, Yale University, PHILIP KIM, Dept. of Physics, Columbia University — Carbon nanotubes (CNTs) serve as a test experimental system for verification of physical models of one-dimensional (1-D) conduction. We aim to excite terahertz standing wave resonances on a CNT, which are predicted to display Luttinger-liquid behavior due to the lack of screening in 1-D. We describe measurements of terahertz (THz) absorption in individual single-walled carbon nanotubes and distinguish between two response mechanisms: bolometric detection due to heating a CNT with a temperature-dependent resistance and the response due to non-thermal electrical contact nonlinearities. This is the first frequency-domain demonstration of THz detection in an individual CNT. The effect of the contact nonlinearity is not decreased at THz frequencies and allows for analysis of the parallel contact capacitance to an individual CNT. Both detection mechanisms are expected to give evidence of the Luttinger-liquid resonant behavior. This experimental technique provides a method to study high-frequency charge excitations in the nanotube as a probe of the strength of the electron-electron interactions in this 1-D system.

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Joel Chudow
Dept. of Applied Physics, Yale University

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