Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Low Temperature Micro-photoluminescence and Raman Spectroscopy of Single-Walled Carbon Nanotubes AJIT SRIVASTAVA, ERIK HAROZ, YOICHI MURAKAMI, JUNICHIRO KONO, Rice University — We report micro-photoluminescence (PL) and resonance Raman spectroscopy studies performed on single single-walled carbon nanotubes at low temperatures. At sufficiently low temperatures, where the thermal energy k_BT is smaller than the predicted dark-bright exciton splitting, PL is expected to be quenched as excitons populate only the dark ground state. However, we observe strong PL from single tubes with very sharp linewidths ($\sim$ 1 meV for 1 nm diameter tubes) even at temperatures as low as 5 K. We will discuss the origin of this emission. We also study the PL linewidth as a function of temperature in order to provide insight into the PL line-broadening mechanisms. Resonance micro-Raman spectroscopy of single tubes was also performed at cryogenic temperatures, scanning the wavelength of the excitation laser beam around the E_{22} transition of the nanotubes, which revealed rich structure both in the vibrational spectrum and the excitation profile. The temperature dependence of various Raman features will be presented.

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Date submitted: 20 Nov 2006 Electronic form version 1.4