Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Low-Temperature Studies of Electrostatic Doping and Phonon Renormalization in Individual Single-Walled Carbon Nanotubes GUGANG CHEN, Honda Research Institute USA Inc., Columbus, OH 43212, TEREZA PARONYAN, GAMINI SUMANASEKERA, Department of Physics, University of Louisville, Louisville, KY 40292, ELENA PIGOS, AVETIK HARUTYUNYAN, Honda Research Institute USA Inc., Columbus, OH 43212 — Electrostatic doping of carbon nanotubes (CNTs) induced by applied external gate voltage (V_g) in the field-effect transistor (FET) configuration allows controllable variation of charge density and the Fermi level in nanotubes. Raman scattering from a CNT is very sensitive to doping and its interaction with the surrounding environment. Recently, the peculiarities of G-mode as a function of gate induced carrier at room temperature have been reported in [1] [Nature Nanotechnology 2, 725 (2007)]. In the present work, we used Raman scattering to study the p- and n- electrostatic doping of CNT as a function of V_g in a wide range of temperature from 6.8 K to 300 K. Virtually symmetric blue-shifting of the G-mode for both p- and n- doping of CNTs has been observed. We found that the prehistory of the CNT measurement as well as environment interaction such as gas adsorption on CNT plays an important role on the observed phenomena. Explanation of our findings will be discussed based on phonon energy renormalization of carbon nanotubes [1] due to the carrier density variation during electrostatic doping.

Gugang Chen
Honda Research Institute USA Inc., Columbus, OH 43212

Date submitted: 21 Nov 2008 Electronic form version 1.4