## Abstract Submitted for the MAR06 Meeting of The American Physical Society

Phonon scattering in Carbon Nanotube Field Effect Transistors - an NEGF Treatment. SIYURANGA KOSWATTA, SAYED HASAN, MARK LUNDSTROM, Electrical and Computer Engineering, Purdue University, M.P. ANANTRAM, NASA Ames Research Center, DMITRI NIKONOV, Intel Corp. — We examine the influence of phonon scattering on DC current transport in carbon nanotube field-effect transistors using the non-equilibrium Green's function (NEGF) formalism. Both optical and acoustic phonon modes are considered, and electronphonon interaction is modeled through a scattering self-energy. Intra-valley scattering due to longitudinal optical (LO) and radial breathing mode (RBM) phonons is examined. Zone-boundary phonon eigenmodes that mediate inter-valley scattering are found to be a mixture of fundamental polarizations such as LO/TA and to couple strongest to the electrons. The effect of phonon scattering on the current vs. voltage characteristic of a filed-effect transistor is found to have distinct gate voltage (Vg) dependence. High-energy optical phonons can significantly degrade the ON-current (large Vg) while their effect is negligible in the OFF-state (low Vg). On the other hand, low-energy phonons (acoustic and RBM) can considerably affect the current transport for all gate biases. Their influence is enhanced at low Vg due to the one-dimensional density of states.

<sup>1</sup>This work is supported by the grant NASA INAC NCC 2-1363

Mark Lundstrom Electrical and Computer Engineering, Purdue University West Lafayette, Indiana 47907-1285

Date submitted: 01 Dec 2005 Electronic form version 1.4