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Simulation of Electronic Transport in Carbon Nanotube Field Effect Transistors[1] DYLAN MCGUIRE, FERDOWS ZAHID, LEI LIU, McGill University, RICHARD MARTEL, Universite de Montreal, HONG GUO, McGill University — In recent years, Carbon nanotube (CN) field effect transistors (CNFETs) with a sub-threshold slope of 40mV/dec have been demonstrated, which is less than the thermal limit of 60mV/dec[2]. By exploiting inter-band tunneling, the transmission ratio comes to depend on the density of states rather than the thermal distribution of carriers in the contacts. Using tight-binding approximations to the Hamiltonian in the Keldysh non-equilibrium Green's function (NEGF) formalism, we study the transport properties of CNFETs under a tunneling mode bias. Phonon coupling effects are included through the self-consistent Born approximation (SCBA). The mode-space approach to decoupling the Hamiltonian[3] is extended to include chiral nanotubes, such that a more realistic class of CNs may be treated with computational efficiency. Further, a comparison is made between the π-orbital and $\pi + \sigma$-orbital tight-binding models. Here, we find that transport is minimally affected. The geometry and electrostatic contact doping are examined to optimize device performance.

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[2]Appenzeller, J., *et al.*, *IEEE Trans. Elec. Dev.*, **52**, 2568, (2005)
[3]Venugopal, R., *et al.*, *J. Appl. Phys.,* **92**, 3730, (2002)

Dylan McGuire
McGill University

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