Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Effect of surface roughness, defects and phonon scattering on electron current through silicon nanowires[1] ALEXEI SVIZHENKO, PAUL LEU, KYEONGJAE CHO, Department of Mechanical Engineering, Stanford University, Stanford, CA, 94305 — Silicon nanowires (SiNW) can become an important building block of nanoscale devices and circuits. Many experimental groups have fabricated SiNWs and measured their current-voltage characteristics. While electron current was found to be very high by some measurements, it is also highly sensitive to chemical modification of NW surfaces. It is therefore important to understand the detailed mechanisms of electron transport in the presence of external factors (e.g., surface roughness, surface defects, dopants, or phonon scattering) and estimate the current carrying capacity of SiNW. In this talk we will discuss our theoretical calculations of current-voltage characteristics of SiNW based on non- equilibrium Greens function (NEGF) equations using an $sp^3d^5s^*$ tight-binding Hamiltonian. We will focus on the effect of surface roughness, random defects and inelastic electron-phonon scattering on electron transport.

[1]This work was supported by Intel Corporation

Alexei Svizhenko
Department of Mechanical Engineering, Stanford University, Stanford, CA, 94305-4045

Date submitted: 30 Nov 2005 Electronic form version 1.4