Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Direct measurements of lateral variations of Schottky barrier height across "end-on" metal contacts to Si nanowires by ballistic electron emission microscopy W. CAI, Y. CHE, J.P. PELZ, The Ohio State Univ., E.R. HEMESATH, L.J. LAUHON, Northwestern Univ. — Semiconducting nanowires (NWs) are of great interest for future electronic devices, but much needs to be understood about how carrier injection and transport at the contacts are affected by small-size effects [1] and local defects. Here we report measurements of *lateral variations* of the local barrier height across individual "end-on" Au Schottky contacts to vertical ∼100 nm diameter Si NWs using ballistic electron emission microscopy (BEEM). Vertical Si NWs were grown on Si (111) substrates, embedded in spin-on-glass, and planarized with a chemical mechanical polish. A brief BHF etch and thin Au film deposition were then used to make end-on NW contacts. BEEM measurements show that the local Schottky barrier height (SBH) at the edge of two separate NWs is ∼23±3 meV lower than at the NWs center, most likely due to a stronger local electric field at the contact edge. Electrostatic simulations of a variety of possible mechanisms indicate that positive charge ($\sim 3\times 10^{11}$ e/cm^2) near the NW surface (due to near-surface defects or donors) together with geometry-enhanced electric fields effect at the NW edge could produce the stronger local electric field and resulting lower SBH at the contact edge. Work supported by NSF Grant No. DMR-0805237. [1] F. Leonard *et al.*, Phys. Rev. Lett. **84**, 4693 (2000).

Yulu Che
The Ohio State Univ.

Date submitted: 28 Nov 2009 Electronic form version 1.4