Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Spatial Resolution of Electrical Measurements Performed with Scanning Probe Microscopes as a Function of Tip Shape ILONA SITNITSKY, VINCENT LABELLA, College of Nanoscale Science and Engineering, State University of New York, JOSEPH KOPANSKI, National Institute of Standards and Technology — Scanning capacitance microscopy and Scanning Kelvin force microscopy are used to measure complex dopant profiles in semiconductors and surface potential/work function images respectively. Both techniques measure a signal related to the capacitance between the tip and sample. The spatial resolution and accuracy of both techniques depends on the shape of the terminal tip and the stray capacitance between the sample and cantilever. Tip diameter and the aspect ratio (length/width) of the tip are important parameters. We have measured the SCM and SKFM response using three different styles of SPM tip: conventional metal-coated silicon cantilevered tips, solid Pt wire tips, and a conventional silicon tip which was terminated by a single carbon nanotube. Samples measured included ultra shallow ion implanted dopant profiles, which were annealed at four different temperatures to produce junction depths between 10 nm and 40 nm; a work function test structure with alternating lines of Al, Cr, and Au; and a dopant concentration calibration structure. The ability of the three types of SPM tips to resolve the four slightly different dopant profiles and the width of the transitions between different materials was characterized.

Joseph Kopanski
Semiconductor Electronics Division,
National Instituite of Standards and Technology

Date submitted: 08 Dec 2009 Electronic form version 1.4