Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

The Virtual Scanning Tunneling Microscope: A Novel Probe Technique for Imaging Two-Dimensional Electron Systems ADAM SCIAMBI, KATHRYN TODD, DAVID GOLDHABER-GORDON, Stanford University, SETH BANK, ARTHUR GOSSARD, University of California, Santa Barbara
— We propose a novel probe technique, the virtual scanning tunneling microscope (VSTM), which could provide both spatial and spectroscopic information about two-dimensional electron systems (2DESs) in semiconductor heterostructures. The VSTM's innovation is the addition of a second 'probe' 2DES separated by a low barrier from the sample 2DES below. Simulations show that a positively-biased tip held above the sample surface can diminish the interlayer barrier and induce tunable tunneling between the two 2DESs. If the tip is scanned, the tunneling region will follow below, acting as a virtual tip while screening the true tip from the sample 2DES. This probe technique is motivated by interesting local 2DES physics that can only be studied indirectly because of the depth of 2DESs; we describe a range of predicted spatially-organized phases of 2D electrons, and transport properties of ErAs self-assembled quantum dots, which could be accessed with this new probe. We also present preliminary experimental results from a GaAs/AlGaAs bilayer 2DES sample, supporting the results of the simulation.

Adam Sciambi
Stanford University

Date submitted: 20 Nov 2006 Electronic form version 1.4