

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**Simulating the interaction of a scanning probe with the quantum Hall liquid** GARY STEELE, RAYMOND ASHOORI, NEMANJA SPASOJEVIC, MIT — Motivated by recent experiments [1], we have developed a simulation of the interaction of a metallic scanning probe with a 2D electron system (2DES) in the quantum Hall regime. The simulation is based on an electrostatic relaxation method, modified to include the non-linear screening of the 2D electron system at high magnetic fields. Using 2D simulations with cylindrical symmetry that allow us to account for the exact shape of the tip, we predict the diameter and width of ring shaped incompressible strips (ISs) induced by DC tip biases. Extending these results to 3 dimensions, we incorporate the effect of the disorder on the shape of the IS, and predict the formation of quantum dot islands observed in [1]. Comparison of the simulation results with experimental data provides a direct and quantitative view of the disorder of a very high mobility 2DES. [1] G. A. Steele, R. C. Ashoori, L. N. Pfeiffer, and K. W. West, Phys. Rev. Lett. 95, 136804 (2005)

Gary Steele  
MIT

Date submitted: 30 Nov 2005

Electronic form version 1.4