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**The Virtual Scanning Tunneling Microscope: A Novel Probe Technique for Imaging Two-Dimensional Electron Systems** ADAM SCIAMBI, DAVID GOLDHABER-GORDON, Stanford University, SETH BANK[1], ARTHUR GOSSARD, University of California, Santa Barbara — We propose a novel probe technique, the virtual scanning tunneling microscope (VSTM), which will 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 greatly 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 which could be accessed with this new probe. We follow with experimental results showing induced tunneling in a GaAs/AlGaAs bilayer 2DES sample, which we characterize thoroughly and use to tunnel into a quantum Hall liquid.

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