Abstract Submitted
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Imaging Coherent Electron Flow in a Two-Dimensional Electron Gas with a Perpendicular Magnetic Field[1] K.E. AIDALA, A.C. BLESZYNSKI, R.M. WESTERVELT, Harvard University, M.P. HANSON, A.C. GOSSARD, U.C. Santa Barbara — Scanning probe microscopy (SPM) at liquid He temperatures can be used to image electron flow from a quantum point contact (QPC) in a GaAs/AlGaAs two-dimensional electron gas (2DEG) in a perpendicular magnetic field. A charged SPM tip creates a perturbation directly beneath it, which scatters electrons incident from the QPC (1). Recording the changes in the QPC conductance as we vary tip position creates an image of the flow, including interference fringes that provide information about the accumulated phase of the electrons. Our new SPM allows us to reach He-3 temperatures and to apply a magnetic field. At zero magnetic field with the QPC biased to the first conductance plateau, the image shows a well-defined branch of electron flow. Introducing a magnetic field of about 50 mT breaks the time-reversal symmetry, by enclosing magnetic flux inside the football-shaped roundtrip path, and the amplitude of the conductance decays in the image at longer distances until the branch is no longer visible. (1) Topinka, M.A., Westervelt, R.M., Heller, E.J. "Imaging Electron Flow." Physics Today 56 (12) 47-52 DEC 2003

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