Abstract Submitted
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Quantum Transport in Oxide Nanostructures[1] JEREMY LEVY, CHENG CEN, DANIELA F. BOGORIN, University of Pittsburgh — We describe low-temperature magnetotransport experiments in nanostructures formed at the $LaAlO_3/SrTiO_3$ interface using a conducting AFM writing technique.[2,3] Measurements on a 6-nm wide Hall cross containing $N \approx 250$ electrons (density $n = 1.6x10^{12} cm^{-2}$) show evidence for quantized conductance, with notable departures from traditional quantized Hall behavior. A pronounced weak antilocalization feature near $B = 0$ is exhibited in both the Hall and magnetoresistance channels, indicating the presence of significant spin-orbit (Rashba) coupling. A 14-nm wide nanowire with lower carrier density (density $n = 8.5x10^{11} cm^{-2}$) exhibits magnetoresistance plateaus associated with integer Landau level filling factors ν=2,3,...,9, and the fractional filling factors ν=7/3 and 11/5. The ability to fashion conducting structures with extreme nanoscale dimensions and distinct signatures of quantum transport opens new opportunities for the development of novel quantum devices.

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[2]C. Cen, S. Thiel, K. E. Andersen, C. S. Hellberg, J. Mannhart, and J. Levy, Nature Materials **7**, 2136 (2008).
[3]C. Cen, S. Thiel, J. Mannhart, and J. Levy, Science **323**, 1026 (2009).

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