Abstract Submitted
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Tunable Magneto-electric Subbands in Oxide Electron Waveguides[1] GUANGLEI CHENG, Univ of Sci and Tech of China, ANIL ANNADI, SHICHENG LU, Univ of Pittsburgh, HYUNGWOO LEE, JUNGWOO LEE, CHANG-BEOM EOM, Univ of Wisconsin-Madison, MENGCHEN HUANG, PATRICK IRVIN, JEREMY LEVY, Univ of Pittsburgh — Strontium titanate-based complex-oxide interfaces hold great promise for exploring new correlated electron physics and applications in quantum technologies. Previous reports show electron mobility can be greatly enhanced in 1D [2], while the 2D interface can contain 1D channels due to the presence of ferroelastic domains. In addition, carrier density measurements at the 2D interface by Shubnikov-de Haas (SdH) oscillations and Hall effect reveal a large discrepancy. Here we fabricate quasi-1D electron waveguides at the $LaAlO_3/SrTiO_3$ (LAO/STO) interface to locally probe the interface. The conductance of the waveguides is fully quantized, and the corresponding magneto-electric subbands can be depopulated by increasing the magnetic field. The 2D carrier densities (10^{12} cm^{-2}) extracted from magnetic depopulation are consistent with measurements by SdH oscillations at the 2D interface. Our results show that magneto-electric subbands of quasi-1D electron waveguides can reproduce known SdH signatures without discrepancies in electron density, and suggest that 2D SdH measurements may also arise from quasi-1D channels.

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[2]Nano. Lett. **13**, 364 (2013), Phys. Rev. Lett.**17**, 096801 (2016)

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