

Abstract Submitted
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Cooper Pair Writing at the LaAlO₃/SrTiO₃ Interface¹ CHENG CEN, DANIELA F. BOGORIN, University of Pittsburgh, CHUNG WUNG BARK, CHAD M. FOLKMAN, CHANG-BEOM EOM, University of Wisconsin-Madison, JEREMY LEVY, University of Pittsburgh — Superconducting semiconductors offer unique ways to exert electrostatic control over macroscopic quantum phases. The recently demonstrated nanoscale control over conductivity at the LaAlO₃/SrTiO₃ interface raises the question of whether nanoscale control over superconducting phases can be realized. Here we report low-temperature magnetotransport experiments on structures defined with nanoscale precision at the LaAlO₃/SrTiO₃ interface. A quantum phase transition is observed that is associated with the formation of Cooper pairs, but a finite resistance is observed at the lowest temperatures. Higher mobility interfaces exhibit larger Ginsburg-Landau coherence lengths, a stronger suppression of pairing by magnetic field as well as Shubnikov-de Haas oscillations. Cooper pair localization, spin-orbit coupling, and finite-size effects may factor into an explanation for some of the unusual properties observed.

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Cheng Cen
University of Pittsburgh

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