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Andreev Bound States in Confined Superconducting Semiconductor Nanowires[1] GUANGLEI CHENG, MICHELLE TOMCZYK, SHICHENG LU, JOSH VEAZEY[2], MENGCHEN HUANG, PATRICK IRVIN, JEREMY LEVY, University of Pittsburgh, HYUNGWOO LEE, SANGWOO RYU, CHANG-BEOM EOM, University of Wisconsin-Madison — The hybridization of superconductors (SC) and semiconducting nanowires leads to a variety of interesting phenomena including nanoscale superconductivity and Majorana fermion physics. Andreev bound states (ABS), which are a discrete energy spectrum as a result of Andreev reflections of electrons and holes between two normal-SC interfaces, are predicted to support Majorana bound states under certain conditions. The $LaAlO_3/SrTiO_3$ interface possesses native superconductivity and strong spin-orbit coupling and is thus a promising platform for observing signatures of Majorana fermions. Here we investigate a superconducting nanowire quantum dot created by reversible "write" and "erase" processes using a conductive atomic force microscope tip. Transport studies show that electrons can travel in different regimes dominated by resonant pair tunneling and Andreev reflection in a single device.

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