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Investigating dimensional crossover of spin-orbit coupling in $LaAlO_3/SrTiO_3$ nanowires[1] RONGPU ZHOU, MICHELLE TOMCZYK, GUANGLEI CHENG, SHICHENG LU, MENGCHEN HUANG, PATRICK IRVIN, Univ of Pittsburgh, HYUNGWOO LEE, SANGWOO RYU, CHANG-BEOM EOM, Univ of Wisconsin-Madison, JEREMY LEVY, Univ of Pittsburgh — Weak anti-localization is a macroscopic observation of a quantum transport phenomenon in two-dimensional systems with spin-orbit coupling in which destructive self-interference of carrier trajectories leads to an enhanced conductivity at low magnetic fields. Characterizing spin-orbit coupling at the $LaAlO_3/SrTiO_3$ (LAO/STO) interface is important in realizing this system's potential as a principal host for oxide nano-electronics. Previously, the spin-orbit coupling at the 2D LAO/STO interface was shown to be gate-tunable. Here, we study a crossover from 2D to 1D regimes using nanowires at the LAO/STO interface using weak anti-localization measurements. Transport measurements were performed on nanowires with widths varying from 200 nm down to 10 nm. A series of magnetoresistance measurements were performed at various backgate voltages to study carrier-density dependence. The results are fit to both 2D and 1D models of a weak anti-localization conductance correction due to Rashba spin-orbit coupling.[2]

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[2]Y. Kim, et al., Phys. Rev. B 87, 245121 (2013).

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