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Positive and Negative Coulomb Drag in a 1D Quantum Circuit
DOMINIQUE LAROCHE, Mcgill University and Sandia National Laboratories, GUILLAUME GERVAIS, Mcgill University , MIKE LILLY, JOHN RENO, Sandia National Laboratories — We report Coulomb drag measurements between tunable vertically-coupled quantum wires. The wires are fabricated in a GaAs/AlGaAs double quantum well heterostructure with a 15 nm barrier separating the quantum wells. The Coulomb drag signal is mapped out versus the number of subbands occupied in each wire, and regions of both positive and negative drag are observed (D. Laroche *et. al.* Nature Nanotechnology, doi:10.1038/nnano.2011.182). The observation of negative Coulomb drag at a high one-dimensional electronic density is not predicted by the usual momentum-transfer model for Coulomb drag and shows that the existing picture of the drag effect in one-dimension is incomplete. In order to clarify the origin of this negative signal, temperature dependencies of the Coulomb drag are presented both in the positive and in the negative drag regimes. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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