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Experimental Evidence of Spin-Incoherent Luttinger Liquid State in Semiconductor Quantum wires[1] MUSTAFA MUHAMMAD, University of Cincinnati, Cincinnati,Ohio 45221, STEVEN HERBERT, Xavier University, Cincinnati, Ohio 45207, RICHARD NEWROCK, PHILIPPE DEBRAY, University of Cincinnati, Cincinnati,Ohio 45221 — We have measured the Coulomb drag between two spatially separated parallel quantum wires in the absence of tunneling to experimentally probe the recently proposed spin-incoherent Luttinger liquid (SILL) state. This new state is considered to exist in one-dimensional electron systems when the electron density is sufficiently low and the electron-electron interaction is strong, leading to $J<<T<<E_F$, where $J$is the exchange coupling of spins and E_F the Fermi energy. The measured drag resistance in the strictly one-dimensional (1D) transport regime is found to follow a power-law temperature dependence with a negative exponent (-0.65) in the temperature range 70mK – 1.2K, in excellent agreement with the prediction of SILL theory for $4k_F$ backscattering. The drag resistance is also found to decay exponentially with wire separation confirming the backscattering nature of the momentum transfer process.

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