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Transport of GaAs two-dimensional holes in strong Coulomb interaction regime JIAN HUANG, D.C. TSUI, Princeton University, L.N. PFEIFFER, K.W. WEST, Bell Labs, Lucent Technologies — We report experimental findings on the 2D holes in a GaAs/AlGaAs heterojunction insulated-gate field-effect transistor in the strong interaction regime ($E_{ee} >> E_F, kT$) with the carrier densities (p) varying from 7×10^9 cm^{-2} to 7×10^8 cm^{-2}. Though the temperature dependence of the resistivity (ρ) resembles that observed in typical 2D Metal-to-Insulator Transition (MIT), there are two things strikingly different. First, for each density, a kink/dip appears in the T-dependence of the conductivity (σ) around a characteristic temperature which we call T_c. In the T_c-p relation, there is a sudden change at a characteristic density which is the same as the critical density p_c where the apparent MIT is observed. The linear T_c-p at high densities suggests that T_cs for $p > p_c$ correspond to the Fermi temperature T_Fs. However, T_c shows little p-dependence at $p < p_c$ ($p_c = 4 \times 10^9$ cm^{-2}). Second, T_c divides the σ-T into a linear part for $T > T_c$ and a power-law part for $T < T_c$. The σ is finite at the base temperature of 35mK even for the lowest density 7×10^8 cm^{-2}. These results rule out the possibility of hopping transport, or the insulator of a pinned Wigner crystal.

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