

Abstract Submitted
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Nonactivated transport driven by Coulomb interactions with tunable shapes¹ JIAN HUANG, Wayne State University, LOREN PFEIFFER, KEN WEST, Princeton University — In high quality updoped GaAs field-effect-transistors, the two-dimensional (2D) charge carrier concentrations can be tuned to very low values similar to the density of electrons on helium surfaces. An important interaction effect, screening of the Coulomb interaction by the gate, rises as a result of the large charge spacing comparable to the distance between the channel and the gate. Based on the temperature -dependence of the resistivity results from measuring four different GaAs heterojunction-insulated-gate field-effect-transistor (HIGFET) samples, the power law characteristics are found for 2D hole densities $\leq 2 \times 10^9$ cm⁻² with an exponent universally depending on a single dimensionless parameter [1], the ratio between the mean carrier separation and the distance to the metallic gate that screens the Coulomb interaction. Thus, the interaction-driven electronic properties are not only sensitive to the relative strength, but also the shape of the interaction potential.

[1] Jian Huang, L. N. Pfeiffer, K. W. West, to appear on Phys. Rev. Lett. (2013)

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