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Giant Fluctuations of the Coulomb Drag BORIS NAROZHNY, The Abdus Salam ICTP, ADAM PRICE, ALEX SAVCHENKO, University of Exeter, DAVID RITCHIE, Cavendish Laboratory, University of Cambridge — Coulomb drag has been shown to provide information about electron-electron interactions not available from conventional conductance measurements, e.g. [1]. For mesoscopic conductors, a spectacular interference phenomenon is UCF. There has been a prediction that Coulomb drag should also show similar fluctuations: with decreasing temperature the fluctuations in the drag are expected to become larger than the average drag, resulting in a random change of the sign of the drag with varying carrier density [2]. Contrary to the UCF, the origin of these fluctuations involves both quantum interference and electron-electron interaction effects. Here we report the first observation of reproducible fluctuations of Coulomb drag in a double-layer GaAs structure, as a function of both the carrier density and magnetic field. Surprisingly, the observed fluctuations are almost four orders of magnitude larger than originally predicted in the theory, which considered diffusive transport of interacting electrons. We explain the observed enhancement by the fact that in ballistic transport, realised in our structures, the Coulomb drag probes the local properties of the system. The latter are expected to show much larger fluctuations than the global ones. [1] Gramila, Eisenstein, et al PRL 66, 1216 (1991). [2] Narozhny and Aleiner, PRL 84, 5383 (2000).

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