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Unconventional transport in ultraclean graphene constriction devices MARTA PITA VIDAL, QIONG MA, Massachusetts Institute of Thechnology, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, PABLO JARILLO-HERRERO, Massachusetts Institute of Thechnology — Under mesoscopic conditions, strong electron-electron interactions and weak electron-phonon coupling in graphene lead to hydrodynamic behavior of electrons, resulting in unusual and unexpected transport phenomena. Specifically, this hydrodynamical collective cooperation of electrons is predicted to enhance the flow of electrical current, leading to a striking higher-than-ballistic conductance through a narrow geometrical constriction. To access the hydrodynamic regime, we fabricated high-quality, low-disorder graphene nano-constriction devices encapsulated by hexagonal boron nitride, where electron-electron scattering dominates impurity scattering. We will report on our systematic four-probe conductance measurements on devices with different constriction widths as a function of number density and temperature. The observation of quantum transport phenomena that are inconsistent with the non-interacting ballistic free-fermion model would suggest a macroscopic transport signature of electron viscosity.

Marta Pita Vidal
Massachusetts Institute of Thechnology

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