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Quantum corrections to the conductivity in graphene ALEKSEY KOZIKOV, University of Exeter, FEDOR TIKHONENKO, University of Southampton, ALEX SAVCHENKO, University of Exeter, BORIS NAROZHNY, Karlsruhe Institute of Technology, ANDREI SHYTOV, University of Exeter — The low-temperature conductivity in electron systems is determined by two quantum corrections. They originate from the interference of electron waves scattered by impurities (weak localisation, WL) and electron-electron interaction (EEI) in the presence of disorder. In graphene, due to the chirality of charged carriers, the quantum interference is sensitive not only to inelastic, dephasing, scattering, but also to elastic, inter- and intra-valley, scattering processes. It was theoretically predicted that depending on the scattering rates of such processes, weak antilocalisation (WAL) is possible in graphene. In this work we study both magnetoresistance and the temperature dependence of the conductivity and observe a transition from WL to WAL by tuning the carrier density and temperature. We show that quantum interference in graphene can survive at temperatures up to 200 K due to weak electron-phonon scattering. We also investigate the EEI correction, which is separated from the WL correction by two methods, and show that it is also affected by intra-valley scattering. This scattering leads to a new temperature regime of EEI. We find the Fermi liquid constant to be small, -0.1, and discuss the origin of this value.

Aleksey Kozikov
University of Exeter

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