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Infrared spectroscopy of gated structures based on single- and bi-layer graphene[1]

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Infrared spectroscopy was employed to investigated the charge dynamics in graphene integrated in tunable gated devices (Nature Physics 4, 532 (2008)). These measurements verified that electrons in single-layer graphene behave like Dirac quasiparticles but most importantly revealed several unexpected results that are beyond the theoretical predictions for idealized graphene. Several of our findings including, a systematic enhancement of the Fermi velocity at low energy and also the "residual" conductivity at frequencies below $2E_F$ are indicative of many-body interactions. Recent infrared study of bilayer graphene uncovered a pronounced asymmetry in the optical conductivity upon injection of electrons and holes (arXiv:0807.3776). We believe this result is suggestive of a marked asymmetry between the valence and conduction bands in bilayer samples.

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