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Interaction effects in graphene p-n junctions[1]

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We review our recent analytical and numerical studies of a new class of graphene devices: lateral p-n junctions. Such structures are realized experimentally by modulating the electron density in graphene samples with external gates. Our theory describes the charge density distribution, the electric field profile, and the resistance of such p-n junctions. The proper treatment of the electrostatic screening beyond the linear order is crucial for obtaining correct results for all these quantities. In particular, the electric field at the interface of the electron and hole regions is strongly enhanced due to limited screening capacity of Dirac vacuum. This nonlinear screening effect can significantly reduce the junction resistance. It is necessary to include it in order to obtain a good agreement with the experiments. More subtle interaction effects such as the Bragg reflection of quasiparticles on Friedel oscillations near the p-n interface are also discussed.

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