Quantum Transport Simulations for Clean Graphene Devices

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Electrons in clean graphene are known to behave like Dirac fermions due to its celebrated energy dispersion linear in momentum. Despite the discovery of graphene in 2004, devices of ultraclean samples with micron-scale mean free paths became accessible only recently. Reliable quantum transport simulations in the ballistic regime for understanding and predicting high-quality transport experiments have therefore become increasingly demanded nowadays. In this talk, keys to quantum transport simulations for clean devices will be briefly introduced. In the main part of the talk, selected topics will be discussed, possibly including Fabry-Pérot interference, snake states, gate-defined electron waveguides, valley-isospin-dependent conductance oscillations, transition of anti-Klein to Klein tunneling in bilayer graphene, Klein-collimated electron beams, and graphene with Moiré superlattice potential.

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