
SEMINAR: Negative mobility and Landau diamonds in graphene

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11:00 to 12:00

Elements Room

I will discuss two distinct transport phenomena in high-mobility monolayer graphene. The first concerns the Dirac electron-hole plasma that forms near charge neutrality at elevated temperatures. Analysis of longitudinal and Hall resistivities reveals strong Coulomb drag: majority carriers pull minority carriers along with them, reversing their expected drift direction and producing negative mobility. I will discuss the competition between electron-hole collisions and scattering by phonons and impurities, and its implications for a hydrodynamic description of the Dirac plasma.

The second part will present unpublished experiments on nonlinear transport in the low-temperature Shubnikov-de Haas regime. Maps of differential resistivity versus carrier density and DC Hall voltage reveal diamond-shaped regions of low resistance, termed Landau diamonds, and a bias-induced reversal of the oscillation phase. Measurements on devices of different widths support the Hall voltage as the controlling parameter in this experiment. I will discuss an interpretation based on the tilting and overlap of Landau bands in the Hall electric field and the use of diamond boundaries to estimate Landau-level spacings.

Hosted by: Prof. Dr. Frank Koppens