CFEL SCIENCE

Colloquium

7th December 2012 - 14:00

CFEL-bldg. 99, seminar rooms I, II, III

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Seeing electrons in two-dimensions: optical spectroscopy of graphene

Optical spectroscopy provides an excellent means of understanding the distinctive properties of electrons in the two-dimensional system of graphene. Within the simplest picture, one has a (zero-gap) semiconductor with direct transitions between the well-known conical bands. This picture gives rise to a predicted frequency-dependent absorption of $\pi\alpha$ = 2.3%, where α is the fine-structure constant. We will demonstrate that this relation is indeed satisfied in an appropriate spectral range in the near infrared, but that at higher photon energies electron-hole interactions significantly modify this result through the formation of saddle-point excitons. Optical spectroscopy also permits a detailed analysis of how the linear bands of graphene, corresponding to massless Dirac Fermions, are modified to yield massive electrons through interlayer interactions in bilayer and few-layer graphene sheets. The observation of a tunable band gap in bilayer and trilayer graphene will also be discussed. We will present recent measurements in which the electron and phonon dynamics are investigated by ultrafast pump-probe spectroscopy.

Host: Martina dell'Angela, UHH-ASG