CFEL SCIENCE

Colloquium

08. June 2011 - 11:00

FLASH HALL, Seminar Room (28c)

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The effective fine structure constant of graphene measured with attosecond x-ray imaging

Electrons in graphene behave like Dirac fermions, permitting phenomena familiar from high energy physics to be studied in a solid state setting. A key question is whether or not these Fermions are critically influenced by Coulomb correlations. In this talk I will describe inelastic x-ray scattering experiments on crystals of graphite, which we have used, in conjunction with new reconstruction algorithms, to image the dynamical screening of charge in a freestanding, graphene sheet. We found that the polarizability of the Dirac fermions in graphene is enhanced by excitonic effects, improving the screening of interactions between renormalized quasiparticles. I will argue that the strength of interactions is characterized by a scale-dependent, effective fine structure constant, $\alpha(k,\omega)$, whose value approaches ~1/7 at low energy and large distances. I will discuss the implications of this result for the behavior of Coulomb impurities in graphene, as well as recent efforts to detect strongly correlated ground states.

*J. P. Reed, et al., Science 330, 805 (2010)

Host: Andrea Cavalleri, CFEL