center for nanophysics and advanced materials

Condensed Matter Colloquium

Thursday, May 3, 2012

2 pm, Room 1201

Brian LeRoy

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Imaging Local Electronic Properties of Graphene

Scanning probe microscopy is a powerful tool to probe low-dimensional systems. The local information provided by scanning probe microscopy is invaluable for studying effects such as interactions and scattering. Using this approach, we have probed the local electronic properties of graphene. Graphene is a single atomic layer sheet of carbon atoms in a honeycomb lattice. Because of the honeycomb lattice, it has a unique linear dispersion relation and the charge carriers behave as massless fermions near the Dirac point. We have studied the effect of charged impurities, edges and the underlying substrate on the local density of states. We find that long-range scattering from charged impurities locally shifts the charge neutrality point leading to electron and hole puddles. Near edges, we observe oscillations in the electron density that change wavelength as a function of energy and have an unusual decay length because of the chiral nature of the quasiparticles. By using boron nitride as a substrate, we observe an improvement in the electronic properties of the graphene as well as a moire pattern due to the misalignment of the graphene and boron nitride lattices. We find that the periodic potential due to the boron nitride substrate creates a set of 6 new Dirac points in graphene.

Refreshments at 1:30 pm in Room 1305F

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