Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Kondo Effect for Massless Dirac Fermions in Graphene[1] L. S. MATTOS, C. R. MOON, P. B. VAN STOCKUM, J. C. RANDEL, H. C. MANOHARAN, Stanford University, M. W. SPRINKLE, C. BERGER, W. A. DE HEER, Georgia Tech, K. SENGUPTA, SINP, A. V. BALATSKY, LANL — We experimentally probe the addition of the spin degree of freedom to the local physics of graphene. This real spin degree of freedom is expected to become intertwined in various coherent scattering processes involving pseudospin and chirality intrinsic to single monolayers of graphene. A compendium of theoretical work on the interaction of localized spins with Dirac electrons predicts that low-temperature screening of localized magnetic moments by nodal quasiparticles gives rise to an unconventional Kondo effect, in which a critical exchange coupling can be controlled by charge carrier doping. We report the observation of this elusive Kondo ground state of Dirac particles, using scanning tunneling microscopy of adsorbed magnetic atoms on epitaxial graphene at low temperature. Tunneling spectroscopy and quasiparticle interference maps reveal chiral, linearly dispersing carriers that form sharp bimodal resonances around individual impurities, an effect traceable to Kondo screening of spins centered on two different graphene lattice sites. Using Fourier-transform scanning tunneling spectroscopy and concomitant measurements in a high magnetic field, we deduce the origin of these many-body ground states.

[1]We acknowledge support from DOE

Laila Mattos
Stanford University

Date submitted: 21 Nov 2008 Electronic form version 1.4