Abstract Submitted
for the SES12 Meeting of
The American Physical Society

Electronic Multicriticality in Bllayer Graphene[1] ROBERT THROCKMORTON, VLADIMIR CVETKOVIC, OSKAR VAFEK, Florida State University, National High Magnetic Field Laboratory — We use renormalization group (RG) methods to investigate the symmetry-breaking phases of bilayer graphene. We derive the flow equations for different coupling constants that appear in a low-energy effective theory for the system, and show how they may be used to determine the different symmetry-breaking phases in the system. We are able to map out all of the possible phases that the system is unstable to. We also apply our methods to the special case of finite-range, monotonically-decreasing, density-density interactions. We map out which phase(s) that the system is unstable to as a function of the overall interaction strength and of the range. We find that the system is unstable to an antiferromagnetic state for short-range interactions and to a nematic state, in which the parabolic degeneracy of the low-energy modes splits into two Dirac-like cones, for long ranges. Finally, we investigate, within the framework of variational mean field theory, the behavior of the antiferromagnetic state in the presence of a magnetic field applied perpendicular to the sample. We show how to determine the energy gap in the system, and find a slight non-monotonic behavior at low fields and a quasi-linear behavior at high fields. We then compare this result to experimental findings.

[1]Supported in part by the NSF CAREER Award under Grant DMR-0955561.

Robert Throckmorton
Florida State University, National High Magnetic Field Laboratory

Date submitted: 18 Sep 2012 Electronic form version 1.4