CONDENSED MATTER SCIENCES SEMINAR

Professor Chunli Huang

University of Kentucky

Host

Dr Cyprian Lewandowski

Title

Non-perturbative Landau-Level Mixing and SU(4) Symmetry Breaking in Graphene Friday, April 25th, 2025 1st Floor – B101 15:00-16:00

Abstract

Recent scanning tunneling microscopy experiments on graphene at charge neutrality under strong magnetic fields have uncovered a ground state characterized by intervalley-coherence state (IVC). In contrast, non-local spin transport experiments in double-encapsulated graphene, which has a higher dielectric constant, have identified an antiferromagnetic (AF) ground state. We propose a mechanism to reconcile these conflicting observations, by showing that Landau-level mixing can drive a transition from AF to IVC with the reduction of dielectric screening. Our conclusion is drawn from studying the effect of Landau-level mixing on the lattice-scale, valley-dependent interactions to leading order in graphene's fine structure constant. To go beyond perturbative treatments, I introduce a novel renormalization group approach for computing Haldane pseudopotentials non-perturbatively. Finally, I will discuss a striking transport signature of the IVC state—a momentum-space analog of the AC Josephson effect.