Seminar

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Abstract

Landau levels (LL) in high quality two-dimensional electron systems (2DES) host an array of fractionalized electronic phases whose nature depends on their polarization in competing orbital and spin degrees of freedom. The LL index (N) plays an important role in determining the ground state of a half filled level, with the emergent Fermi-sea that forms in N=0 to displaying instabilities towards a gapped phase in N=1 and a nematic stripe phase in N=2. In this presentation I will discuss the physics of high mobility ZnO-based 2DES at filling factor n = 5/2 as the orbital character of electrons is continuously tuned between N=1 and 0 character. In stark contrast to the naive expectation of a first-order transition between level-polarized states, a rich cascade of five phases with distinct transport features are resolved as charge is gradually transferred between the two levels. In addition to incompressible (in N=1) and compressible (in N=0) states, intermediate polarizations witness additional compressible, incompressible and anisotropic nematic phases. The emergence of these unexpected phases in an orbitally mixed regime when the levels are near degeneracy motivates speculation this is a promising system for realizing unanticipated flavors of inter-level coherent states at fractional filling factors.

About the Speaker