

Chez Pierre

Presents ...

Monday, September 14, 2015

12:00pm

MIT Room 4-331



Chez Pierre Seminar

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” Tunneling spectroscopic evidence of Wigner crystallization near integer quantum Hall states“

Theories predict that a Wigner crystal of quasiparticles exists near integer quantum Hall states as an insulating phase with an expected transition temperature in the range of a few hundred mK or below. This state of broken translational symmetry under a perpendicular magnetic field is expected to show exotic tunneling spectrum as one tunes the interparticle spacing and magnetic field strength. However, measurements of electrons tunneling into two dimensional system under strong perpendicular magnetic fields have faced fundamental and technical challenges; the quantum system under study can be heated and perturbed by the tunneling current and, at certain densities, the lateral conductivity can almost vanish which hampers the tunneled electrons moving out of the system.

We have used Time Domain Capacitance Spectroscopy to overcome these issues, allowing accurate measurements of the density of states of two-dimensional holes in GaAs at 20 mK and in high magnetic field. We discovered filling factor dependent anomalous resonances that are antisymmetric in energy and density around filling factor 1. Analysis of the resonance structure is consistent with a picture of holes that are dressed by interactions with bosonic degrees of freedom. We attribute this bosonic mode to the gapless magneto-phonon mode emergent from the development of crystalline order of charged quasiparticles.