Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Quantum Hall Ferromagnetism in twisted bilayer graphene

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Twisted bilayer graphene with a large twist angle is a novel 2D bilayer system with strong interlayer Coulomb interactions, whilst suppressed interlayer carrier tunnelling due to momentum mismatch between the Dirac cones of individual graphene layers. This interlayer decoherence disentangles the layer degree of freedom from the spin-valley space. In this talk, I will discuss the role of charge screening effects in electronically decoupled twisted bilayer graphene that determines the Landau level crossings and the multicomponent Quantum Hall effect resulting from combinations of broken symmetry states with spin and valley flavours of the constituent layers. I will also demonstrate the field induced Kosterlitz-Thouless transition to an ordered ground state in the N=0 Landau level at zero filling factor, which is consistent with predictions of an intervalley coherent state of Kekulé order. At the end, I will describe the pinning of low-energy topological excitations, i.e., skyrmions with spin and valley textures, at charged defects in the graphene channel which results in pronounced hysteresis and electron-hole asymmetry in the Quantum Hall regime.

Tuesday, Jul 8th 2025

10:30 Hrs (Tea / Coffee 10:15 Hrs)

Auditorium, TIFRH