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

Seminar

Spin-orbital magnetism in moire Wigner molecules

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The interplay of spin and orbital degrees of freedom offers a versatile playground for the realisation of a variety of correlated phases of matter. However, the types of spin-orbital interactions are often limited and challenging to tune. In this talk, I will analyse a new platform for spin-orbital interactions based upon a lattice of Wigner molecules in moire transition metal dichalcogenides (TMDs). Leveraging the spin-orbital degeneracy of the low-energy Hilbert space of each Wigner molecule, I will argue that TMD materials can host a general spin-orbital Hamiltonian that is tuneable via the moire superlattice spacing and dielectric environments. The phase diagram for this model contains a rich landscape of phases driven by spin-orbital interactions, ranging from ferri-electric valence bond solids to a helical spin liquid, thereby establishing moire Wigner molecules in TMD materials as a prominent platform for realising correlated spin-orbital phenomena.

Friday, Sep 19th 2025

14:30 Hrs (Tea / Coffee 14:15 Hrs)

Seminar Hall, TIFRH