CONDENSED MATTER SCIENCES SEMINAR

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Host

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FRACTIONAL QUANTUM ANOMALOUS HALL EFFECT IN TWISTED BILAYER TRANSITION METAL DICHALCOGENIDES

Friday, October 25th, 2024

1st Floor – B101

15:00-16:00

Recently, both the integer and fractional quantum Hall effect have been observed in twisted bilayer transition metal dichalcogenides (TMDs) at zero magnetic field, generating widespread interest in this materials system. In this talk, I will first introduce the basic models describing twisted bilayer TMDs, including the origin of the nontrivial topology. I will then discuss how the machine learning method can be used to establish the microscopic Hamiltonian and the important role of polarization charges in determining the band topology. Finally, I will discuss the possibility of non-Abelian states in this material system.

Reference

1. Fractional Chern insulator in twisted bilayer MoTe2, Wang et al, Phys. Rev. Lett. 132, 036501 (2024)
2. Gate-tunable antiferromagnetic Chern insulator in twisted bilayer transition metal dichalcogenides, Liu et al, Phys. Rev. Lett. 132, 146401(2024)
3. Polarization-driven band topology evolution in twisted MoTe and WSe2, Zhang et al, Nature Communications 15, 4223 (2024)
4. Higher Landau-Level Analogues and Signatures of Non-Abelian States in Twisted Bilayer MoTe2, Wang et al, arXiv: 2404.05697