Theory of Integer and Fractional Chern Insulators in Semiconductor Moire Superlattices

(Session D, Oral)

Fengcheng Wu

School of Physics and Technology, Wuhan University

Moire superlattices formed by two-dimensional semiconductors of transition metal dichalcogenides (e.g., WSe2 and MoTe2) have become an important platform to study novel quantum phases arising from strong correlation and/or topological effects. Quantum phases observed in semiconductor moire superlattices include Mott insulators, generalized Wigner crystals, integer and fractional Chern insulators. In this talk, I will present our theoretical study on topological phases in twisted bilayer MoTe2. For integer filling factors, we map out the interaction-driven topological phase diagram based on a three-orbital lattice model, which illustrate a rich set of competing phases [1]. For fractional filling factors, we perform a variational mapping of the moire Chern bands to Landau levels, which provides a clear mechanism for the formation of fractional Chern insulators [2].

[1] Wen-Xuan Qiu, Bohao Li, Xun-Jiang Luo, Fengcheng Wu, Phys. Rev. X 13, 041026 (2023).
[2] Bohao Li, Fengcheng Wu, arXiv:2405.20307.