

Workshop on Twistronics and Moiré Materials: Bridging Theory and Experiments

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Twisted bilayer graphene (TBG) near the "magic angles" has emerged as a rich platform for strongly correlated states of two-dimensional (2D) Dirac semimetals. Topological insulator thin films because of their ability to host low-energy Dirac nodes, present another platform where "twistronics" can be used to engineer flat bands. However, topological insulator systems encounter some theoretical difficulties in engineering flat bands using the twistronics approach. I will discuss these issues. Using simple surface state electronic models for thin film magnetic topological insulators, I will show how flat moire bands can still be achieved in these systems[1]. I will discuss the similarities and differences of such moire systems with the twisted multilayers of graphene and more recent developments in twisted multilayers of cuprate superconductors. Finally, I will discuss the possible many-body phases that can appear in these moire systems[2].

[1] Gaurav Chaudhary, Anton A. Burkov, and Olle G. Heinonen, Phys. Rev. Res. 4, 043034 (2022).

[2] Gaurav Chaudhary and Robert-Jan Slager (in preparation).