Topological Floquet Engineering of Twisted Bilayer Graphene

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In twisted bilayer graphene (TBG), the choice of the twist angle allows for tailored engineering of the low energy absorption spectrum. This tunability makes TBG a perfect playground for Floquet engineering. Motivated by the measurement of ultrafast light-induced Hall currents in monolayer graphene [1], we investigate the topological properties of twisted bilayer graphene for an intermediate twisting angle in and out of equilibrium on the basis a full Moiré-unit-cell tight-binding model [2]. By breaking time-reversal symmetry with a circularly polarized light field, we induce a transition to a topologically non-trivial Floquet band structure with a Berry curvature analogous to a Chern insulator, which can be controlled via inversion-symmetry-breaking back-gate potentials. Additionally, I will discuss preliminary results of my ongoing work on light-matter couplings in magic-angle twisted bilayer graphene (MATBG).

[1] J. M. McIver et al., Nature Physics 16, 38-41 (2020)
[2] G. E. Topp et al. PRR 1, 023031 (2019)

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