Abstract Submitted
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Magnetic breakdown in twisted bilayer graphene[1] CHI-KEN LU, H.A. FERTIG, Indiana University Bloomington — Recently, superlattice patterns on graphene sheets have become available in both twisted bilayer systems and graphene on BN substrates. These systems are interesting due to the recent demonstration that in magnetic fields they host an observable Hofstadter spectrum, and that (for TBG) they host low energy saddle points(SPs) in their spectra which can lead to interesting many-body instabilities. We consider the role that these SPs play in weak magnetic fields, where the crossover from Landau level behavior to Hofstadter behavior in the spectrum is controlled by them. This phenomenon is a realization of magnetic breakdown, in which semiclassical trajectories change their topology when the energy passes through such SPs. In the TBG, we find that a description fully incorporating the magnetic symmetries is only possible if one doubles the Brillouin zone. This leads to a multiplicity of semiclassical quantization conditions on orbits above the saddle points, beyond the usual interior flux quantization, allowing the richness of the Hofstadter spectrum to become apparent at these higher energies. Possible experimental implications, including cyclotron resonance, magnetic susceptibility, and creation of open orbits (with accompanying metal-insulator transition) will be discussed.

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