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Landau Level Spectra in a Twisted Bilayer Graphene

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We investigate Landau level spectra of twisted bilayer graphene under a perpendicular magnetic field, showing that the layers provide rich electronic structure depending on misoriented angle. New types of excitations with Landau level sequences due to the reflection of interlayer coupling level are matter of interest in the present work. We calculate the electronic structure of bilayer systems with a relative small angle rotation of the two graphene layers. Calculated Landau level spectra for twisted bilayer graphene using a continuum formulation are in good agreement with existing experimental and theoretical studies. Twist angle dependent numerical simulations provide significant insights for the nature of the Landau level spectra in bilayer graphene, combining signals from both massive and massless Dirac fermions. We finally discuss the influence of the graphene layers in the experimental sample that related to the magneto-transport measurements including quantum Hall conductance.

Keywords: bilayer graphene, Landau level, quantum Hall conductance, massless Dirac fermion