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Commensuration and Interlayer Coherence in Twisted Bilayer Graphene E.J. MELE, University of Pennsylvania — The low energy electronic spectra of rotationally faulted graphene bilayers are studied using a long wavelength theory applicable to general commensurate fault angles. We find that Lattice commensuration requires low energy electronic coherence across a fault and preempts massless Dirac behavior near the neutrality point. Sublattice exchange symmetry distinguishes two families of commensurate faults that have distinct low energy spectra which can be interpreted as energy-renormalized forms of the spectra for the limiting Bernal and AA stacked structures. Sublattice-symmetric faults are generically fully gapped systems due to a pseudospin-orbit coupling appearing in their effective low energy Hamiltonians. We use the model to study the dependence of the interlayer coherence scale on fault angle and the electronic response of faulted bilayers to applied static fields.

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