Asymmetric correlated states in twisted monolayer-bilayer graphene

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In twisted monolayer-bilayer graphene massless and massive Dirac fermions mix together and lead to asymmetric correlated states and out-of-equilibrium criticalities characterized by superconductivity-like non-linear current-voltage characteristics. In this theoretical work, we first develop an analytical model to explain the observed asymmetry in formation of correlated states with respect to carrier density and displacement field [1]. Using the linearized gap equation method, we calculate the stability and critical temperature for different symmetry breaking phases, including spin density waves, charge density waves, and valley ordered phases. We compare our theoretical findings with available experimental data.
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[1] Shuigang Xu, et al. Nature Physics, 5 (2021)