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Quasiparticle interference (QPI) in twisted bilayer graphene

Twisted bilayer graphene, in which the lattice mismatch between neighboring layers gives rise to an additional potential modulation, creates novel electronic features distinct from graphene. Its most fascinating aspect is the Fermi velocity decreases with decreasing the twist angle between the two layers [1]. We calculate the effect of quasiparticle interference (QPI) on the spatial variations of the local density of states in twisted graphene in the neighborhood of an isolated impurity. A number of characteristic behaviors of interference are identified in the Fourier transformed spectrum of scanning tunneling microscope (STM), which can map the energy dependent local density of states by measuring the position dependence of the current /voltage characteristics [2]. Combining the powerful technique, STM, the QPI features may be analyzed to reveal information about the momentum space structure of the electronic states in twisted bilayer graphene [3]. We investigate quasiparticle interference in twisted bilayer graphene in two frameworks: the tight-binding model and the effective continuum model based on the Dirac equation. By using the T-matrix approximation to analyze the effect of a localized impurity on the local density of states in twisted bilayer graphene, we calculate the rotation angle dependence of QPI patterns, which are huge different from those of monolayer and bilayer graphene. Combing the experimental data from STM measurements for various energies and twisted angles, our calculated QPI results provide the scattering information of twisted bilayer graphene.

References

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