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**Impurity scattering interference in high- $T_c$  superconductors**

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— Recent STM measurements have observed many inhomogeneous patterns of the local density of state (LDOS) on the surface of high- $T_c$  cuprates. In particular, for Bi2212 crystals, well defined interference patterns in the momentum space has been seen at low bias voltage. And recently, for the underdoped sample, it has been observed that the spatially “checkerboard” LDOS modulations appear at higher energies. By using a simple impurity scattering potential with BCS Hamiltonian, we describe all LDOS features in Bi2212 materials in terms of quasiparticle scattering interference. We are able to obtain all these features seen by STM experiments in both real- and momentum- space. Our results also show that the observed “checkerboard” patterns are dispersionless. Additionally, by using variational Monte Carlo method, we show that the impurity scattering are greatly suppressed due to the presence of strong correlations.

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