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Extinction of quasiparticle interference in underdoped cuprates with coexisting order BRIAN ANDERSEN, University of Copenhagen, PETER HIRSCHFELD, University of Florida — Recent scanning tunnelling spectroscopy measurements [Y. Koksaka et al., Nature 454, 1072 (2008)] have shown that dispersing quasiparticle interference peaks in Fourier transformed conductance maps disappear as the bias voltage exceeds a certain threshold corresponding to the coincidence of the contour of constant quasiparticle energy with the antiferromagnetic zone boundary. Here we argue that this is caused by quasistatic short-range coexisting order present in the d-wave superconducting phase, and that the most likely origin of this order is disorder-induced incommensurate antiferromagnetism. We show explicitly how the peaks are extinguished in the related situation with coexisting long-range antiferromagnetic order, and discuss the connection with the realistic disordered case. Since it is the localized quasiparticle interference peaks rather than the underlying antinodal states themselves which are destroyed at a critical bias, our proposal resolves a conflict between scanning tunneling spectroscopy and photoemission regarding the nature of these states.

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