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Dynamically induced Fermi arcs and pockets: A model for the pseudogap in underdoped cuprates[a]

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Abstract. We investigate the effects of the dynamic bosonic fluctuations on the Fermi surface reconstruction in two dimensions as a model for the pseudogap in underdoped cuprates. At energies larger than the boson energy ωb, the dynamic nature of the fluctuations is not important and the quasi-particle dispersion exhibits the shadow feature like that induced by a static long range order. At lower energies, however, the shadow feature is pushed away by the finite ωb. The detailed low energy features are determined by the bare dispersion and the coupling of quasi-particles to the dynamic fluctuations. We present how these factors truncate the Fermi surface to produce the Fermi arcs or the Fermi pockets, or their coexistence. Our principal result is that the dynamic nature of the fluctuations, without invoking a yet-to-be-established translational symmetry breaking hidden order, can produce the Fermi arc or Fermi pocket centered away from the ($\pi/2$, $\pi/2$) towards the zone center. This is discussed in comparison with the experimental observations.

[a] The presentation slides are available at the website
http://www.its.caltech.edu/~yehgroup/documents/ITAP2011_Conference_Choi.pdf