The High-Tc Cuprates viewed in k-space

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One advantage that the FRG method has, as a tool to investigate the phase diagram of the 2-Dim Hubbard model appropriate to the cuprates, is its basis in **k**-space. The earlier FRG calculations by Honerkamp et al [1] identified strong scattering connecting the antinodal regions in k- space and appearing simultaneously in several mutually reinforcing channels, as the driving interelectron interactions. This thesis is supported by a recent set of FRG calculations by Ossadnik et al [2] which examined the breakdown of Landau Fermi liquid behavior in the normal state of the overdoped region, and found these scattering processes lead to an inverse lifetime linear in the temperature T and anisotropic in **k**-space. These features agree nicely with the recent experiments of Hussey and coworkers [3] on the normal state of overdoped Tl-cuprates. The quantum critical point at lower hole densities that marks the transition from a metallic state with a full Fermi surface to a state with a truncated Fermi surface and characteristics of a hole doped Mott insulator, can be described, at least phenomenologically, by a gap opening in the antinodal regions. The propagator proposed by Yang et al [4] leads to Fermi pockets centered on the nodal directions, which appear as Fermi arcs due to a strongly varying quasiparticle weight. Recent ARPES measurements on underdoped BSCCO by Yang et al [5] offer support for this propagator [6].

[1] C.Honerkamp et al PRB B63, 035109, (2001)

[2] M.Ossadnik et al, PRL, 101, 256405 (2008)

[3] M. Abdel-Jawad et al, PRL 99, 107002, (2007)

[4] K.-Y. Yang et al PRB B73, 174501, (2006)

[5] H.-B. Yang et al Nature, 456, 77, (2008)

[6] K.-Y. Yang et al EPL, 86, 37002, (2009)