Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Properties of the "quasi-particles" at a nodal nematic quantum critical point EUN-AH KIM, PAUL ORETO, STEVE KIVELSON, Stanford University, EDUARDO FRADKIN, UIUC — We study the properties of a $d-$wave superconductor in the vicinity of a quantum critical transition to a nematic (or $d+s$ superconducting) phase. Most interactions have little effect on nodal quasiparticles, due to the limitted phase space available for scattering. The few critical modes that do couple effectively (such as the phase fluctuations treated in the context of QED3) produce a renormalized (fixed point) dispersion that is isotropic (pseudo-Lorentz invariant). This contrasts with the extreme anisotropy found in ARPES experiments on cuprate superconductors, which is often considerably larger even than anticipated from mean-field considerations based on the magnitude of Δ_0/E_F We find quantum fluctuations near a nodal nematic quantum critical point strongly enhance the dispersion anisotropy, and are efficient inelastic scatterers. The quantum field theory which describes the nodal nematic critical point is non-Lorentz invariant and the nodal quasiparticles display clear non-Fermi liquid behavior. The fermion spectral function displays nontrivial structure, which can be compared with those measured by ARPES in cuperate superconductors.

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Date submitted: 20 Nov 2006 Electronic form version 1.4