Quantum oscillations near metallic quantum critical point.

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Quantum criticality is a pervasive origin of new physics in metals. Tuning through the zero-temperature termination point of a line of classical phase transitions is thought to suppress the intrinsic energy scale, driving the system through a quantum critical point. The enhanced fluctuations in the vicinity of critical point in metallic high temperature superconductors are believed to be responsible for non-Fermi liquid transport behavior, such as linear-in-temperature resistivity over a broad temperature range.[1–3] Recent quantum oscillation measurements reveal a fast evolution of quasiparticle properties approaching critical doping in high-temperature superconductors, in strong support of quantum critical origin of their phase diagram.[4, 5] We suggest that these quantum oscillation studies indicate doping evolution of quasiparticle scattering dynamics near the Fermi surface rather then divergence of quasiparticle mass. In particular, we observe that near quantum critical point the full temperature dependence of the amplitude of quantum oscillations, constrained by thermodynamic inequalities, cannot be accounted for with anomalous quasiparticle lifetime effects alone.

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