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Dichotomy in the T-linear resistivity in hole-doped cuprates - extended criticality and quasiparticle decoherence

NIGEL HUSSEY, University of Bristol

From analysis of the in-plane resistivity $\rho_{ab}(T)$ of $La_{2-x}Sr_xCuO_4$, we show that normal state transport in overdoped cuprates can be delineated into two regimes in which the electrical resistivity varies approximately linearly with temperature. In the low temperature limit, the T-linear resistivity extends over a very wide doping range, in marked contrast to expectations from conventional quantum critical scenarios. The coefficient of this T-linear resistivity scales with the superconducting transition temperature T_c, implying that the interaction causing this anomalous scattering is also associated with the superconducting pairing mechanism. At high temperatures, the coefficient of the T-linear resistivity is essentially doping independent beyond a critical doping $p_{crit} = 0.19$ at which the ratio of the two coefficients is maximal. Taking our cue from earlier thermodynamic and photoemission measurements, we conclude that the opening of the normal state pseudogap at p_{crit} is driven by the loss of coherence of anti-nodal quasiparticles at low temperatures.