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**Nodal-antinodal quasiparticle anisotropy reversal in the overdoped high-$T_c$ cuprates.**[1]

ANDREA DAMASCELLI, University of British Columbia

The cuprate superconductors can be tuned through a remarkable progression of states of matter by doping charge carriers into $CuO_2$ planes. The most generic feature of this tuning is a sequence from a Mott antiferromagnetic insulator, to the d-wave superconductor at intermediate doping, and eventually to an overdoped metal which is widely believed to be described by Fermi liquid theory. Of these three, the testing of Fermi liquid theory in the overdoped regime has been particularly hampered by a lack of compounds suitable for a wide range of experimental techniques. Important breakthroughs could come from the study of $Tl_2Ba_2CuO_{6+\delta}$ (Tl2201), a clean and structurally simple system with a very high $T_c$, whose natural doping range extends from optimal to extreme overdoping as one varies the oxygen content. Recent success in high-purity single crystal growth [1] gave us the opportunity of performing the first extensive ARPES study of the low-energy electronic structure of heavily overdoped Tl2201, which reveals a novel phenomenology: contrary to the case of under and optimally-doped cuprates, quasiparticles are sharp near ($\pi$,0), i.e. the antinodal region where the gap is maximum, and broad at ($\pi/2$, $\pi/2$), i.e. the nodal region where the gap vanishes [1,2]. This reversal of the nodal-antinodal quasiparticle anisotropy across optimal doping and its relevance to scattering, many-body, and quantum-critical phenomena in the high-Tc cuprate superconductors, is discussed. [1] D.C. Peets *et al.*, cond-mat/0211028 (2002); [2] M. Platé *et al.*, PRL **95**, 077001 (2005).

[1]This work was done in collaboration with D.C. Peets, M. Platé, J.D.F. Mottershead, I.S. Elfimov, N.J.C. Ingle, M. Raudsepp, Ruixing Liang, D.A. Bonn, W.N. Hardy, S. Chiuzbaian, M. Falub, M. Shi, and L. Patthey.