Photo-enhanced antinodal conductivity in the pseudogap state of high-T_c cuprates

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A major challenge in understanding the cuprate superconductors is to clarify the nature of the fundamental electronic correlations that lead to the pseudogap phenomenon. We used an out-of-equilibrium approach, based on ultrashort light pulses, to prepare a non-thermal distribution of excitations, and to capture via time-resolved broadband reflectivity measurements and time-resolved photoemission measurements novel properties that are hidden at equilibrium [1]. Our framework unveils a universal pseudogap-like region in the temperature (T) and hole-doping (p) phase diagram, delimited by a well-defined $T^*_{neq}(p)$ line. In this region the photoexcitation process leads to a quench of local correlations triggering the evolution of antinodal excitations from gapped (localized) to metallic (delocalized) quasi-particles characterized by a longer lifetime. This photoinduced antinodal metallicity finds a natural explanation in terms of the single-band Hubbard model, in which the short-range Coulomb repulsion leads to a **k**-space differentiation between "nodal" quasiparticles and antinodal excitations, whose self-energy diverges as in the insulating state.

[1] F. Cilento *et al.*, Nature Communications **5**, 4353 (2014).