Dynamics of correlation-frozen antinodal quasiparticles in superconducting cuprates

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The origin of the universal antinodal suppression of quasiparticles in the normal state of high-Tc superconducting (HTSC) copper oxides remains a lively debated issue. Here we perform time-resolved extreme-ultra-violet (EUV) photoemission on a prototypical HTSC cuprate to disclose the ultrafast dynamics of the antinodal states [1]. After photoinducing a non-thermal charge redistribution within the Cu and O orbitals, we observe the transient weakening of the antinodal quasiparticle suppression via the formation of additional states which relax back on the ~100 fs timescale. Our results suggest that the antinodal suppression of states stems from the correlation-driven freezing of the electrons moving along the Cu-O bonds, analogously to the Mott localization mechanism. Finally, we observe an ultrafast gaussian broadening of the O-2p states suggesting an intrinsic spatial inhomogeneity of the charge-transfer photo-excitation process.

References

[1] F. Cilento et al., arXiv:1703.03877