Unambiguous connection between the Fermi surface topology and the pseudogap in $Bi_2Sr_2CaCu_2O_{8+d}$ superconductor

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We have performed electronic Raman scattering (ERS) and angular resolved photo-emission spectroscopy (ARPES) experiments on the same $Bi_2Sr_2CaCu2O_{8+d}$ single crystals with two distinct doping levels located below and above the critical doping pc = 0.22 for which a change of the Fermi surface topology is suspected [1,2,3]. We detect by both techniques the superconducting (SC) gap and the pseudo-gap below pc while solely the SC gap subsists above pc. Concomitantly, we show from ARPES measurements, that the anti-bonding band of the Fermi surface is hole-like below pc and electron-like above [3]. Such a change of Fermi surface topology can possibly induce a change of in the d-wave symmetry of the SC gap with an additional s-wave component [4]. The existence of the pseudogap is definitively connected to the Fermi surface topology which puts strong constraint on theories of the pseudogap phase.

References

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[2] B. Loret, S. Sakai et al. Phys. Rev. Lett. 116, 197001 (2016).
[3] This work will be submitted soon (current 2018)
[4] This work will be submitted soon (current 2018)