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Anomalous suppression of energy gap near the antinode in Bi2212

ALFRED ZONG, Massachusetts Institute of Technology, SUDI CHEN, YU HE, Stanford University, MAKOTO HASHIMOTO, SLAC National Accelerator Laboratory, SHIGEYUKI ISHIDA, YOSHIYUKI YOSHIDA, AIST, Japan, ZHI-XUN SHEN, Stanford University — An energy gap holds special importance in the study of high- $T_c$  superconductors (HTSC) as it is often associated with the order parameter of complex phases in these materials. In hole-doped cuprates around optimal doping, past experiments suggest the presence of two momentum-anisotropic energy gaps originating from d-wave superconductivity and pseudogap. Here we report an anomalous energy gap suppression near the antinode in overdoped Bi2212 that persists from  $T \ll T_c$  to  $T > T_c$ . Our data imply that the suppression may not originate from pair-breaking scattering, but can be phenomenologically described by higher harmonics of a d-wave gap. It is important to uncover the origin of this suppression, which is instrumental in understanding the complex landscape of interacting order parameters in cuprate HTSCs.

Alfred Zong Massachusetts Institute of Technology

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