

Abstract Submitted  
for the MAR13 Meeting of  
The American Physical Society

**Feedback effect on high-energy magnetic excitations in the model high-temperature superconductor  $\text{HgBa}_2\text{CuO}_{4+\delta}$**  YUAN LI, International Center for Quantum Materials, Peking University, China, M. LE TACON, M. BAKR, D. TERRADE, D. MANSKE, Max Planck Institute for Solid State Research, Germany, R. HACKL, Walther Meissner Institute, Bavarian Academy of Sciences and Humanities, Germany, L. JI, M.K. CHAN, N. BARISIC, X. ZHAO, M. GREVEN, School of Physics and Astronomy, University of Minnesota, USA, B. KEIMER, Max Planck Institute for Solid State Research, Germany — Magnetic excitations might play an important role in the superconducting mechanism in the cuprates. Their contribution below  $\sim 60$  meV is manifested by the generic neutron “resonance” feature, which signifies a feedback effect of pairing on the magnetic excitations. However, the spectral weight of the resonance is insufficient to explain the high superconducting temperature ( $T_c$ ). Recent research has demonstrated that intense magnetic excitations exist above 100 meV up to high doping, but it remains unknown whether and how these excitations participate in the pairing mechanism. Here we present a systematic electronic Raman scattering study of the model cuprate superconductor  $\text{HgBa}_2\text{CuO}_{4+\delta}$ . In an overdoped sample upon cooling below  $T_c$ , we observe a pronounced enhancement of a high-energy peak related to two-magnon excitations in insulating cuprates, which is accompanied by the opening of the superconducting gap and can be understood as a high-energy feedback effect that implies a direct involvement of high-energy magnetic excitations in the Cooper pairing. The effect occurs already above  $T_c$  in two underdoped samples, demonstrating a related feedback mechanism associated with the pseudogap.

Yuan Li  
International Center for Quantum Materials, Peking University, China

Date submitted: 08 Nov 2012

Electronic form version 1.4