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Quasi-particles ultrafastly releasing kink bosons to form Fermi arcs in a cuprate superconductor Y. ISHIDA, T. SAITOH, ISSP, U. Tokyo, Japan, T. MOCHIKU, T. NAKANE, K. HIRATA, NIMS, Japan, S. SHIN, ISSP, U. Tokyo, Japan — In a conventional framework, superconductivity is lost at a critical temperature (T_c) because, at higher temperatures, gluing bosons can no longer bind two electrons into a Cooper pair. In high T_c cuprates, it is still unknown how superconductivity vanishes at T_c. Recent angle-resolved photoemission (ARPES) studies revealed a remnant feature of the d-wave superconducting gap in the so-called Fermi arc occurring at $T > T_c$; The loss of superconductivity is thereby attributed to the filling of the near-nodal gap due to spectral broadenings as opposed to the closure of the gap at T_c [Reber *et al.*, PRB2013; Kondo *et al.*, Nature Phys. 2015]. The next step would be to elucidate the underlying mechanism of the spectral broadenings that cause the unconventional loss of superconductivity. We provide evidence that the so-called <˜70-meV kink bosons that dress the quasi-particle excitations are playing the key role. We performed time-resolved ARPES on Bi2212 and monitored the responses of the superconducting gap and dressed quasi-particles to a light pulse. We observe an ultrafast loss of superconducting gap near the d-wave node, or light-induced Fermi arcs, which is accompanied by spectral broadenings and weight redistributions occurring within the kink binding energy. We discuss that the spectral broadening that induce the Fermi arc is due to the undressing of quasi-particles from the kink bosons. The loss mechanism is beyond the conventional framework, and can accept the unconventional phenomena such as the signatures of Cooper pairs remaining at $T > T_c$.

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