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Time resolved Raman scattering on the pair-breaking peak in Bi-2212 – direct observation of the dynamics of the superconducting order parameter PELANGI SAICHU, ILKA MAHNS, ARNE GOOS, STEPHAN BINDER, STEFAN SINGER, University of Hamburg, J. UNTERHINNINGHOFEN, Max-Planck Institut fuer Festkoerperforschung, BENJAMIN SCHULZ, ANDRIVO RUSYDI, University of Hamburg, S.L. COOPER, M.V. KLEIN, University of Illinois at Urbana-Champaign, P. GUPTASARMA, University of Wisconsin-Milwaukee, DIRK MANSKE, Max-Planck Institut fuer Festkoerperforschung, MICHAEL RUEBHAUSEN, University of Hamburg — We employ a novel time resolved two-color pump probe Raman technique to study the electronic dynamics in the superconducting state of the high temperature superconductor Bi-2212. By studying the temporal evolution of the gap and the pair-breaking peak in the superconducting state, we reveal two contributions to the superconducting order parameter that respond within 1 ps and 7 ps, respectively. Both effects conserve spectral weight in the sense that the suppression of the pair-breaking peak appears concomitantly with the build up of in-gap states. The recovery times for both contributions to the gap are different by a factor of 4 outlining fundamentally different coupling mechanisms.

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