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Phonon-mode couplings studied by pump-probe photoemission[1]
MICHAEL SENTEF, Stanford Institute for Materials and Energy Science (SIMES), SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA, ALEXANDER KEMPER, Lawrence Berkeley National Lab, 1 Cyclotron Road, Berkeley, CA 94720, USA, BRIAN MORITZ, Department of Physics, Northern Illinois University, DeKalb, IL 60115, USA, JAMES FREERICKS, Department of Physics, Georgetown University, Washington, DC 20057, USA, ZHI-XUN SHEN, THOMAS DEVEREAUX, Stanford Institute for Materials and Energy Science (SIMES), SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA — Motivated by recent pump-probe photoemission experiments on cuprate superconductors, we show how the coupling of electrons to phonon modes at the same time leads to a prominent kink in the equilibrium band dispersion and to a distinct behavior of relaxation time scales in nonequilibrium experiments. Here, using the nonequilibrium solution of a model photoexcited electron-phonon system we show that the return of the electrons to equilibrium is governed by the equilibrium self-energy so that the phonon frequency sets a window for"slow" versus "fast" relaxation. The overall structure of the relaxation spectroscopy in the time domain allows for a reliable and quantitative extraction of the electron-phonon coupling strength.

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