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Ultrafast transient decoupling and multi-phonon effects in driven electron-phonon systems ALEXANDER KEMPER, Lawrence Berkeley National Laboratory, MICHAEL SENTEF, BRIAN MORITZ, Stanford Institute for Materials and Energy Science, JAMES FREERICKS, Georgetown University, THOMAS DEVEREAUX, Stanford Institute for Materials and Energy Science — Pump-probe experiments have become an increasingly important tool in studying the interaction between electrons and bosons in condensed matter. Here we discuss some of the transient effects that occur during the pumping process using the non-equilibrium Keldysh technique to numerically solve the equations of motion for a strongly coupled electron-phonon system. The scattering of spectral weight while the pump is on decouples the electrons from the phonons, leading to a transient weakening of the electron-phonon spectral features known as kinks. We further note that higher order kinks in the spectra are more readily visible in the time domain by observing changes in the time-resolved ARPES spectra. Finally, we revisit the question of time-resolved relaxation dynamics and highlight the effects of the transients spectral weight re-arrangement there.

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