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Theory of time-resolved spectral function in high-temperature superconductors with bosonic modes[1] JIANMIN TAO, JIAN-XIN ZHU, Los Alamos National Laboratory — Quasiparticle properties are of fundamental importance toward the understanding of high-temperature superconductivity. The nature of bosonic modes, to which electrons are strongly coupled in these systems, is a topic of current extensive discussion. Here we propose to use the time-resolved spectral function to uncover the mystery. First we develop a three-temperature model to simulate the time dependence of electronic and phononic temperatures. The advantage of this model is that it not only takes the tight-binding electronic structure into account, but also is valid in superconducting state. Based on this model, we then calculate the time-resolved spectral function via the double-time Green's functions. We find that the dip-hump structure evolves with the time delay. More interestingly, new phonon structures are obtained when the phonons are excited by a laser field. This signature may serve as a direct evidence for electron-vibration mode coupling.

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