Nonequilibrium Quasiparticle Dynamics in an Unconventional Superconductor with Competing Order

Jian-Xin Zhu*

Theoretical Division & Center for Integrated Nanotechnologies, Los Alamos National Laboratory, Los Alamos, NM 87544, USA
*E-mail: jxzhu@lanl.gov

A common feature of unconventional superconductors, ranging from high-temperature cuprate, heavy fermion, and recently discovered iron-based compounds, is the close proximity of unconventional superconductivity to an antiferromagnetic phase. The interplay of the unconventional superconductivity with the competing order remains an interesting scientific question. Recently, the ultrafast laser pulse pump-probe technique has become a powerful approach to uncover novel phases and associated quasiparticles dynamics in strongly correlated electron systems. Here we study an effective *t*-*t'*-*U*-*V* Hubbard model which captures the competition between antiferromagnetic spin-density wave (SDW) and *d*-wave superconducting (DSC) orderings. We show that an ultrafast electromagnetic field can drive the two competing order parameters uniquely depending on different regimes of hole doping. We further elucidate the consequence of the photoinduced electronic states by calculating the high harmonic generation and nonequilibrium momentum-dependent single-particle spectral function.

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