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Theory of nonequilibrium superconductivity in cuprates
TAKASHI OKA, Department of Applied Physics, The University of Tokyo, VILLE PIETILÄ, Department of Applied Physics, Aalto University — Recently, nonequilibrium properties of Hi Tc superconductors are attracting much interest. This is because new experimental methods such as time resolved ARPES has been applied to cuprates and succeeded in observing the dynamics of photo-excited quasiparticles as well as the temporal evolution of the d-wave superconducting order parameter (e.g., [1]). One can also realize nonequilibrium states in interfaces between cuprates and metal electrodes and control the superconducting order by changing the applied bias [2]. In order to study the dynamics of superconductivity in strongly correlated systems, we developed a novel numerical method by combining the quantum kinetic equation with the fluctuation exchange approximation (FLEX, self-consistent T-matrix approximation) [3]. This method enables us to study the interplay between pair mediating fluctuations, e.g., antiferromagnetic and charge fluctuations, and the dynamics of quasiparticles and superconducting order parameter. In the presentation, we explain the physical insights we obtain by applying this method to nonequilibrium dynamics in d-wave superconductors.

[1] C. L. Smallwood, et al., Science 336, 1137 (2012).
[2] T. Oka, and H. Aoki, Phys. Rev. B 82, 064516 (2010).
[3] T. Oka, and V. Pietil, in progress.

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