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Theory of Superconductivity in Strongly Correlated Electron Systems

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We present a strategy to describe the superconductivity in the strongly correlated electron systems(1). The essential points are the followings.
1. We determine the critical temperature Tc by solving the Dyson-Gorkov equation. In the equation normal and anomalous selfenergy parts are calculated by perturbation theory with respect to on-site Coulomb repulsion U in the Hamiltonian.
2. Anomalous selfenergy corresponding to the gap function is determined by the momentum dependence of interaction between quasi-particles in the Fermi liquid state.
3. Normal selfenergy renormalizes the energy scale by the renormalization factor z which is the inverse of mass-enhancement factor m*/m.
By the above treatment we can determine the critical temperature in a universal way from heavy fermions to high temperature superconductors. Recently we found that even within the high Tc system the renormalization is important to understand the difference of Tc between the two systems, LSCO and YBCO (2).

1) Y.Yanase et.al; Pysics Report 387(2003)1.
2) S.Sasaki, H.Ikeda and K.Yamada;J. Phys. Soc.Jpn. 74(2005)1397.

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