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Development of a two-particle self-consistent method for multi-orbital systems and its application to unconventional superconductors
HIDEYUKI MIYAHARA, RYOTARO ARITA, Department of Applied Physics, University of Tokyo, HIROAKI IKEDA, Department of Physics, Kyoto University
— We extend the two-particle self-consistent method proposed by Vilk and Tremblay [1] to multi-orbital systems. Starting with the sum rules for the spin and charge susceptibilities, we derive self-consistent equations to determine the renormalized effective interactions. We apply this method to LaFeAsO. In the former, we study the two-orbital model for the $La_{2-x}(Sr/Ba)_xCuO_4$ system. FLEX underestimated the pairing instability for it.[2] We show that, in our TPSC, the inter-orbital scattering enhances the d-wave instability. In the latter, we investigate a five-orbital d-model for LaFeAsO. This model has been extensively studied by RPA [3]. There, it has been shown that strong spin fluctuation mediates the s_{+-} superconductivity. On the other hand, it has been pointed out that vertex corrections can enhance orbital fluctuations, which mediate s_{++} superconductivity [4]. Finally, we show that orbital fluctuations can be enhanced in TPSC, while the dominant pairing symmetry is still s_{+-} superconductivity when the system resides.

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[3] K. Kuroki, et al, Phys. Rev. Lett. 101, 087004.
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Hideyuki Miyahara
Department of Applied Physics, University of Tokyo

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