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Cluster dynamic mean-field study on the superconductivity in doped honeycomb lattice Hubbard model XIAO YAN XU, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, HUNG T. DANG, STEFEN WESSEL, Institute for Theoretical Solid State Physics, JARA-FIT and JARA-HPC, RWTH Aachen University, 52056 Aachen, Germany, ZI YANG MENG, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China — The issue of superconductivities emerging from doped honeycomb lattice Mott insulator remains inconclusive. Existing proposals, such as p+ip triplet pairing driven by ferromagnetic fluctuations, d+id singlet pairing driven by antiferromagnetic fluctuations or van Hove singularities in the band structure, are not compatible. This is mainly due to the limitation of various approximated techniques employed in addressing such question with inherent strongly correlated nature. Trying to clarify the situation, we perform large-scale cluster dynamic mean-field simulations to explore the superconductivity instabilities in the doped honeycomb lattice Hubbard model, from medium to strong coupling. To benchmark, we make use of both interaction- and hybridization-expansion continuous time quantum Monte Carlo methods to exactly solve the quantum cluster embedded in self-consistently determined mean-field bath. Temperature dependence of various superconducting susceptibilities are calculated, hence, we provide the least biased results of the competition of the superconductivity in different channels in the phase diagram spanned by doping and electronic interaction.

Xiao Yan Xu
Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China

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