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Study of spin-fluctuation mediated pairing in the Fe-based superconducting ladder $BaFe_2S_3$ YAN WANG, University of Tennessee, ALBERTO NOCERA, GONZALO ALVAREZ, Oak Ridge National Laboratory, STEVE JOHNSTON, University of Tennessee, ELBIO DAGOTTO, University of Tennessee; Oak Ridge National Laboratory — The spin-fluctuation mediated pairing theory has been often applied to explain the superconductivity of Fe-based superconductors and the theoretically predicted gap symmetry and gap structure are consistent with a wide range of experiments. In most Fe-based superconductors, Fe atoms are located in a two dimensional (2D) square lattice. However, Fe atoms forming two-leg ladder structures are present in the recently discovered superconductor $BaFe_2S_3$ with $T_c \sim 20$ K under pressure. Due to its simpler geometry, numerically exact many-body techniques, such as density matrix renormalization group (DMRG), can be used to study the electronic properties and pairing tendencies of this two-orbital ladder system. In this effort, we apply the fully self-consistent fluctuation exchange (FLEX) method based on many-body perturbation theory to study the spin-fluctuation mediated pairing in a single ladder and also in a bundle of ladders with weak inter-ladder hoppings. We elucidate the momentum structure of the possible pairing state and address how changing from 2D to 1D affects the pairing instabilities. By comparing the magnetic excitations and pairing states from FLEX calculations with those from DMRG calculations, we are able to judge the accuracy of the FLEX approximation.

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