ROLE OF THE ELECTRON CORRELATIONS IN THE INHOMOGENEOUS SUPERCONDUCTORS FROM THE BOSON-FERMION MODEL POINT OF VIEW

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To study the role of strong electronic correlations, the boson-fermion (BF) model of superconductivity, supplemented with the strong on-site electron-electron repulsion term U, has been taken into consideration. This model, formulated in real space, has been solved by the means of Gutzwiller and mean-field approximations. The real space Bogoliubov-de Gennes equations allows one to calculate local properties, such as local magnitude of the gap or the local density of states (LDOS), in presence of impurities. It has been shown that, due to electron correlations, the gap is larger near the impurity sites, contrary to the results for the same model but without U. This naturally leads to positive correlation between the values of the order parameter and the positions of impurities, as was observed in various scanning tunneling microscopy experiments performed on $Bi_2Sr_2CaCu_2O_{8+x}$ superconductors. Also, in presence of correlations, the low-energy electronic excitations in LDOS are protected against disorder.

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