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Grand-canonical variational study for the Gutzwiller-projected BCS wave function TING-KUO LEE, CHUNG-PIN CHOU, Institute of Physics, Academia Sinica, Nankang, Taipei 11529, Taiwan, FAN YANG, Department of Physics, Beijing Institute of Technology, Beijing PRC — We study the Gutzwiller-projected BCS wave function in the 2D extended t-J model using a variational Monte Carlo method. To take into account the effect of Gutzwiller projection, a fugacity factor proposed by Laughlin and Anderson has been included into the coherence factor of the BCS state. We show that the ground-state energy and excitation spectra calculated in the grand-canonical picture are essentially the same as previous results in the canonical scheme if the free energy is used for minimization. Except for La-214 materials, we find that the doping dependence of chemical potential is consistent with experimental findings on several cuprates. We have investigated the asymmetry of tunneling conductance observed by scanning tunneling spectroscopy becomes much stronger as decreasing doping. A very huge enhancement of phase fluctuation in the underdoped regime has been found.

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