The electronic structure within the norm-conserving cluster perturbation theory

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Within a new norm-conserving (NC) approach to the cluster perturbation theory (CPT) for the 2d Hubbard model we study the electronic structure. We have studied the hole doping dependence of the quasiparticle (QP) band structure and the Fermi surface within NC-CPT. We have reproduced the cascade of the quantum phase transitions of the Lifshitz type with increasing doping. In the present approach both the static and dynamical correlations inside each cluster are treated exactly. That is why it allows to describe both the shape of the Fermi surface and the non-uniform spectral weight distribution along the Fermi contour. In the numeric computation of spectral density we substitute a delta-function by a Lorenzian curve with a broadening parameter. It allows to model experimental resolution of ARPES and finite QP life time that may appear due to high order perturbation contributions from the intercluster hopping. The increase of the broadening parameter transforms the small hole pocket in the underdoped region in the arc. Previously similar conclusion has been found by C-DMFT method.