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CPT study of the Fermi-surface reconstruction in the t-J model

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A number of recent experiments have highlighted a remarkable transformation of a large cuprate Fermi surface into small pockets in the underdoped region signaling a breakdown of a conventional Fermi liquid theory in the PG phase. The qualitatively agreement of the experimental data with Fermi surface calculations within phenomenological models based on the measured parameters of the CDW order, suggests that this reconstruction is caused by the bidirectional charge ordering. To address this problem, we employ the cluster perturbation theory based on the exact diagonalization of small clusters for the low doped t-J model. In this way, we show that the translation symmetry breaking and explicitly accounting of the short range correlations induce the FS reconstruction into a nodal electron pocket accompanied by two hole pockets as predicted by mean field calculation and in agreement with experimental data. In contrast to the phenomenological models this approach does not require the introducing of the CDW modulation term by hand and allows to obtain the FS reconstruction based on strongly electron correlations.

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