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Charge Order Instability in Doped Resonating Valence Bond State and Magnetic Orbits from Reconstructed Fermi Surface in Underdoped Cuprates[1] LONG ZHANG, Tsinghua Univ, JIA-WEI MEI, Perimeter Institute for Theoretical Physics — Recent experiments reveal incommensurate charge density wave (CDW) and quantum oscillations (QO) in the pseudogap phase of underdoped cuprates. In this work, we take a phenomenological synthesis of the resonating valence bond (RVB) state and the CDW order. Starting from the Yang-Rice-Zhang (YRZ) ansatz for the Green's function of the RVB state, we show that the CDW instability at wavevectors connecting the tips of the Fermi arcs can induce Fermi surface reconstruction. We find three primary magnetic orbits in the QO spectrum, the CDW-induced electron-like α and hole-like β orbits and the γ orbit enclosing the initial nodal YRZ hole pockets due to magnetic breakdown. Their combinations naturally explain the multi-component QO pattern observed in experiments. The γ orbit encloses an area satisfying the generalized Luttinger theorem. The cyclotron mass of the γ orbit increases monotonically with doping in agreement with the optical Hall angle measurements , while that of the α orbit is enhanced as the CDW order vanishes on approaching two critical dopings. However, we find that the enhancement of m_H^α is overestimated in QO experiments due to the ignorance of the impact of the CDW order suppression with increasing temperature.

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