Spectral properties of a doped frustrated Mott insulator: a slave-fermion study

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We study the spectral properties of the $t-J$ model on the triangular lattice, at zero temperature and at low doping, in order to analyze the electron dynamics in the presence of strong correlation and magnetic frustration. We represent the projected electron operators by means of Schwinger-bosons and slave-fermions, and we solve the resulting Hamiltonian in an $SU(2)$-invariant mean-field approximation. Within this scheme, there are significant antiferromagnetic correlations up to moderate doping, that strongly affect the electron dynamics. In general, the spectra exhibit two clearly distinguishable bands: a heavy one at the top, with a bandwidth of the order of the exchange integral J, and a light band below, with a tight-binding-like dispersion displaced by the magnetic wave vector . The heavy band has its origin in the dressing of the holes by the spin fluctuations, and it has a relatively small spectral weight due to the presence of magnetic frustration, while the light band represents the almost free motion of the electrons at energies above J. As a consequence of these spectral features, we observe a transition between an incoherent metal at low doping and a conventional Fermi liquid for higher doping, driven by the spin fluctuations. In the strong coupling regime, $J/t = 0.4$, the critical doping is $\delta_c \simeq 0.12$.