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Spin excitation spectra of iron-based superconductors from the degenerate double-exchange model ZHIDONG LEONG, WEI-CHENG LEE, University of Illinois at Urbana-Champaign, WEICHENG LV, University of Tennessee at Knoxville, PHILIP PHILLIPS, University of Illinois at Urbana-Champaign
— Using a degenerate double-exchange model, we investigate the spin excitation spectra of iron pnictides. The model consists of local spin moments on each Fe site as well as itinerant electrons from the degenerate d_{xz} and d_{yz} orbitals. The local moments interact with each other through antiferromagnetic J_1-J_2 Heisenberg interactions, and they couple to the itinerant electrons through a ferromagnetic Hund's coupling. We employ the fermionic spinon representation for the local moments and perform a generalized RPA calculation on both spinons and itinerant electrons. We find that in the (π,0) magnetically-ordered state, the spin-wave excitation at (π,π) is pushed to a higher energy due to the presence of itinerant electrons, which is consistent with the previous study using Holstein-Primakoff transformation. In the non-ordered state, the particle-hole continuum keeps the collective spin excitation near (π,π) at a higher energy even without any C_4 symmetry breaking. The implications for the recent neutron scattering measurement at high temperature will be discussed.

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