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Dynamic spin susceptibility of hole-doped high-temperature superconductors in a singlet-correlated conduction band model

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Abstract

We have derived an expression for the dynamical spin susceptibility of a hole-doped high-temperature superconductor taking into account a strong correlation between the magnetization of spins of the localized and itinerant electrons. This formula has been used to calculate the imaginary part of the susceptibility as a function of the frequency and wave vector. The results are compared to experimental data on the inelastic neutron scattering in compounds of the YBa2Cu3O6+y type. A peak in the scattering intensity observed at an energy of about 40 meV in the region of wave vectors Q = (π, π) and an arc-shaped dispersion relief are interpreted as manifestations of the collective spin excitations in the system, the energy of which falls within a superconducting gap (spin exciton). The U-shaped divergent relief observed in the neutron scattering intensity is assigned to collective short-rage-order spin oscillations. © 2008 Pleiades Publishing, Ltd.

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