Abstract Submitted to the
3rd Conference on Concepts in Electron Correlation
30 September - 5 October, 2005
Hvar, Croatia

Spectral properties and order parameter symmetries near ferro- and antiferromagnetic instabilities

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We discuss the symmetry of the ground state order parameters and the low-temperature behavior of the electronic self-energy in the vicinity of a ferro- and antiferromagnetic instabilities in two dimensions. Although the long-range magnetic order is absent at $T > 0$, the self-energy has a non-Fermi liquid form at low energies $|\omega| \lesssim \Delta_0$ near the Fermi level, where Δ_0 is the ground-state energy gap or spin splitting. The spectral function at temperatures $T \lesssim \Delta_0$ has a two- (for the FM) or three- (for the AFM) peak structure with finite spectral weight at the Fermi level. In the FM case this form of the spectral functions implies the quasi-splitting of the Fermi surface in the paramagnetic phase in the presence of strong ferromagnetic fluctuations.

For the ground-state order parameters, we find significant deviations from the conventional s-, p-, or d-wave forms, which is due to the frustration of antiferromagnetism at small and intermediate t'. With adding a direct antiferromagnetic spin-exchange coupling the eigenfunctions in the particle-hole channel have extended s-wave form, while in the particle-particle singlet pairing channel a higher angular momentum component arises besides the standard $d_{x^2-y^2}$-wave component, which flattens the angular dependence of the gap.

Keywords : ferromagnetism,antiferromagnetism,superconductivity,pseudogap