UNIDIRECTIONAL CHARGE INSTABILITY OF THE d-WAVE RVB SUPERCONDUCTOR

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9.7 cm

Recent scanning tunneling microscopy on $Ca_{2-x}Na_xCuO_2Cl_2$ has revealed unidirectional modulation in local electronic density of states that coexists with d-wave superconductivity [1]. Motivated by this result we investigated in the previous studies the emergence of such modulations by assuming *out-of-phase* d-wave order parameters in neighboring domains [2]. Here we use a different strategy: starting from a uniform d-wave superconducting phase we study the energy cost due to imposed unidirectional defects with a vanishing pairing amplitude [3]. Both renormalized mean-field theory and variational Monte Carlo calculations within the t-J model yield that the energies of inhomogeneous and uniform phases are very close to each other, especially in the presence of a tetragonal lattice distortion. This suggests that small perturbations in the microscopic Hamiltonian, might lead to inhomogeneous superconducting phases in real materials.

[1] Y. Kohsaka *et al.*, Science **315**, 1380 (2007).
[2] M. Raczkowski *et al.*, Phys. Rev. B **76** 140505(R) (2007).
[3] M. Capello, M. Raczkowski, and D. Poilblanc, arXiv:0801.2722.

13.4 cm

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