SESSION 1

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Stripes and high T_c superconductivity

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On the stripes present in the cuprates

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Within a year after the discovery of superconductivity in the copper-oxides, Gor'kov and Sokol proposed the presence of two components of itinerant and more localized features in these layered compounds. This kind of microscopic and dynamic phase separation was later rediscovered in charge transfer, t-J, and three-band models as well as others. Experimentally susceptibility, Mössbauer data, NMR/NQR, and pulsed femto-second optical probing indicated such a separation. It is seen most distinctly in the structural investigations with EXAFS, and inelastic neutron scattering. From these the existence of stripes was inferred. For higher dopings their formation will be emphasized upon cooling from JT-type bipolarons. At the stripe formation temperature T* very large oxygen isotope effects have between observed with XANES and inelastic neutron scattering in LASCO and YBCO, confirming the substantial dynamic lattice participation in these HTCS.

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Inherent inhomogeneity in two-component model for cuprates

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Interactions in the two-component model [1] result in tendency to phase segregation at doping in cuprates. The electroneutrality condition limits the growth of domains. We discuss the Coulomb effects in a vicinity of the critical point (defined in the absence of long range forces). Another issue concerns mechanisms responsible for scales of the spatial and time fluctuations in the system. Tendency to phase separation being rather general phenomenon and inherent to practically any short ranged model interaction, we speculate that the so-called precursor (or pseudogap) feature at T* is due to onset of such an inhomogeneous phase coexistence regime and is not related synonymously to appearance of preformed Cooper pairs. Qualitative justifications of these views will be discussed.

Keywords: *two-component models; phase segregation; inhomogeniety; fluctuations scales.*

References

[1] L. P. Gor'kov and A.V. Sokol, JETP Lett. **46**, 420 (1987).

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Duality view on high T_c superconductivity and stripes

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The central conceptual problem in high T_c superconductivity is to reconcile the abundant evidence for stripe-like physics at 'short' distances with the equally convincing evidences for a BCS-like physics at large distances (the `nodal fermions'). Our central hypothesis is that the duality notion applies: the superconductor should be viewed as a condensation of the topological excitations associated with the fully ordered stripe phase. As I will argue, the latter are not only a form of 'straightforward' spin and charge order but involve also a form of 'hidden' or 'topological' long range order which is also responsible for the phenomenon of spin-charge separation in 1+1D. The topological excitation associated with the destruction of this hidden order in 2+1D is of the most unusual kind. We suggest that the associated disorder field theory has a geometrical, gravity like structure while at the same time topological phases appear with no precedent elsewhere.

Keywords*: stripes, superconductivity, duality.*

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