THE STRIPE PHASE AND THE QUANTUM CRITICAL POINT SCENARIO FOR SUPERCONDUCTING CUPRATES

C. Castellani
Dipartimento di Fisica, Universita La Sapienza, Roma, Italy

9.7 cm

Most models with strong local repulsion that had been introduced to represent the CuO_2 planes in the cuprates show phase separation in hole-poor (antiferromagnetic) and hole-rich (metallic) regions. In these models Cooper-pair formation occurs before and near phase separation, pointing to a connection between phase separation and superconductivity. The stripe phase realizes the compromise between the local tendency of the strongly correlated systems towards phase separation and the electrostatic cost to segregate charged carriers. This phase connects the high-doping regime, where charge fluctuations play a major role and enslave spin fluctuations, with the low-doping region of the phase diagram dominated by the spin degrees of freedom. The onset of the stripe phase is governed by a quantum-critical point (QCP), which was placed by the Rome group around optimum doping as confirmed by several experimental findings. In the proximity of the QCP, critical fluctuations mediate singular interactions, providing both a strong pairing mechanism and a source of non-Fermi liquid behavior. Some experimental consequences of this scenario are discussed

13.4 cm

Subject category :
1. Correlated Electrons and High Temperature Superconductors

Presentation mode :
PLENARY LECTURE

Corresponding author :
C. Castellani

Address for correspondence :
Dipartimento di Fisica, Universita La Sapienza, Roma, Italy

Email address :
Claudio.Castellani@roma1.infn.it