Session 23aC

Antiferromagnetism and checkerboard charge order in the vortex state **23aC1**

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The central issue of high Tc superconductivity is the interplay between antiferromagnetism (AF) and superconductivity (SC). SO(5) theory proposes to unify these two forms of order under a common symmetry principle. In 1997, this theory predicted the AF vortex core in the SC state under a magnetic field. This prediction has now been verified by a number of experiments, including elastic and inelastic neutron scattering, NMR, μsR and STM. In this talk, I shall review recent experimental and theoretical progrsses on the AF vortex state. In particular, we will propose a new state in which Cooper pairs forms a checkerboard crystal in a AF background. This state could be realized in underdoped cuprates around the vortex core or above H_c2.

Resonant magnetic mode in high-T_C cuprates **23aC2**

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The spin dynamics of high-T_C cuprates measured by inelastic neutron scattering will be discussed. Over the years, these measurements have evidenced a new magnetic excitation present only in the superconducting state. In particular, recent experiments on single layer $Tl_2Ba_2CuO_{6+\delta}$, have been performed near optimum doping ($T_c \sim 90$ K) that provide evidence of a sharp magnetic resonant mode below T_c in a very similar way than previous reports on bilayers YBCO and BSCO systems. This result supports models that ascribe a key role to magnetic excitations in the mechanism of superconductivity.
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23aC3 Comparative Study on the Magnetic Excitation Specta of Y123 and La214 High-T_c Systems - Are the Dynamical Stripes important? -

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Neutron data of magnetic excitation spectra χ" of $YBa_2Cu_3O_{6.5}$ are compared with results of calculations obtained by the expression $\chi(\boldsymbol{q},\omega)=\chi^0(\boldsymbol{q},\omega)/\{1+J(\boldsymbol{q})\,\chi^0(\boldsymbol{q},\omega)\}$, where $J(\boldsymbol{q})=J(\cos q_x a + \cos q_y a)$. Choosing proper values of band parameters and the T-independent gap amplitude with d-wave symmetry, we obtained quite satisfactory agreement between the observed and calculated results without considering dynamical "stripes". It is found that the broadening at the quasi particles has a role to suppress the antiferromagnetic ordering. Similar studies have also been carried out for La214, where effects of the "dynamical stripes" can be clearly identified.

23aC4 Paramagnetic Vortex State in $Pr_{2-x}Ce_xCuO_4$ Single Crystals

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Muon spin rotation (μSR) measurements of the internal magnetic field distribution in the vortex state of $Pr_{2-x}Ce_xCuO_4$ single crystals are presented. A large increase in the average internal field is observed when the crystals are cooled below T_c. The observation of a paramagnetic shift in the vortex state with a local probe supports models attributing the paramagnetic Meissner effect to currents flowing inside the superconductor. We also report measurements of the in-plane magnetic penetration depth λ_{ab} for the case where a diamagnetic shift is observed below T_c.