SESSION 11

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Excitations at the Fermi surface of Bi2212 and Bi2201

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We first examine the question of how to define a Fermi surface in strongly correlated systems which might not have quasiparticles. We then examine in detail the excitations around this Fermi surface, and find that in the high temperature superconductors, there are no quasiparticles in the normal state, but they are recovered in the superconducting state. We then look at the doping, temperature and frequency dependence of the lineshape with a view to determine the energy scales present in the data.

Keywords*: Fermi surface, non-Fermi liquid, quasiparticles*

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Electronic structure and Fermi surfaces of $Bi_2Sr_2CaCu_2O_{8+\delta}$ observed from high resolution ARPES

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We present our latest high resolution ARPES results from Bi2212 and Bi2201. We discuss a robust Momentum Distribution Curve (MDC) method for determining Fermi Surface (FS) crossings, as well as the application of this method to extracting the FS topology of these compounds. Other new physics that comes out of this data and analysis wil be discussed.

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First principles simulations of angle-resolved photointensities High-T_c's

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A satisfactory description of the ARPES spectra from the high-T_c's must necessarily model the photo-excitation process properly by taking into account the matrix element involved, the complex modifications of the wave functions resulting from a specific surface termination, and the effects of multiple scattering and finite lifetimes of the initial and final states. With this motivation, we have developed and implemented the one step model of photoemission, wherein the aforementioned effects are treated realistically, to encompass arbitrarily complex lattices. ARPES spectra in $YBa_2Cu_3O_7$ (Y123), $YBa_2Cu_4O_8$ (Y124), $Nd_{2-x}Ce_xCuO_4$ (NCCO) and $Bi_2Sr_2CaCu_2O_8$ (BISCO,Bi2212) in the tetragonal phase have been considered. Extensions to incorporate effects of modulations and distortions of the lattice in BISCO and other systems are in progress. Our simulations give insight into signatures in the ARPES spectra of bilayer spliKing, possible role of surface states, polarization and termination effects, etc. In this talk, we discuss these and other relevant aspects of the ARPES spectra of the high-T_c's in the light of our theoretical results.

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ARPES Fermi surface of high temperature superconductors

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We present recent very high resolution angle resolved photoemission spectroscopy results on the Fermi surface mapping of several high temperature superconductors (HTSC). Effects of stripes and photoemission matrix elements on the collected spectra are discussed. Results from pure and Pb doped $Bi_2Sr_2CaCu_2O_8$ samples, $La_{1-x}Sr_xCuO_4$ and $La_{1-x-y}Sr_xNd_yCuO_4$ as well as some other HTSCs are presented. We discuss recent controvercy about the Fermi surface of $Bi_2Sr_2CaCu_2O_8$.

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Neutron (π,π) resonance in underdoped Bi2212 and its relation to the electronic spectra as measured by ARPES

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The main goal of this study is to understand, at a quantitative level, the relation existing between the (π,π) resonance mode observed by Inelastic Neutron Scattering (INS) and the electronic spectra, in the superconducting state, as measured by Angle Resolved Photoemission Spectroscopy (ARPES). While most ARPES data on the doping dependence of the spectral function have been obtained for Bi2212, the only INS data available on the doping dependence of the neutron resonance have been reported for Y123. We report, for the first time, INS measurement obtained on underdoped (T_c=70K) Bi2212 single crystals. Below the critical temperature a resonance centered at Q=(π,π,π) (odd symmetry) and E=34 MeV appears in the neutron spectra. Its temperature and Q-dependence clearly indicate the magnetic origin of this resonance. Furthermore, we compare our INS data with ARPES data obtained on the same crystal. It is found that the energy of the neutron resonance is in good agreement with the mode inferred from the peak-dip-hump structure of the spectral function observed below T_c. Our result indicates that the resonance/mode is intimately connected to the pairing mechanism. The implication of the odd symmetry of the magnetic resonance for the interpretation of the ARPES data will also be discussed.

Keywords: *Neutron scattering, ARPES, resonance mode*.

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