Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Spatially resolved quasiparticle tunneling spectra in the vortex state of optimally hole-doped $YBa_2Cu_3O_x$ (Y-123) M.S. GRINOLDS, A.D. BEYER, M.L. TEAGUE, N.-C. YEH, Phys. Dept., Caltech, Pasadena, CA — We report cryogenic scanning tunneling spectroscopic (STS) studies of superconducting single crystalline Y-123 ($T_c = 93$ K) as a function of magnetic field. We study and model the influence of competing orders (COs), which coexist with superconductivity (SC), on the quasiparticle (QP) excitation spectra. The spatial dependence of the QP tunneling spectra is probed via STS to quantify the presence and spatial extent of SC and CO. Zero-field spatial maps of the QP spectra (100×100 nm^2) in Y-123 exhibit long-range spatial homogeneity of SC ($\Delta_{SC}= 23\pm1$ meV) associated with the spectral coherence peaks and the presence of CO ($V_{CO}= 33\pm2$ meV) that gives rise to the spectral satellite features at $\Delta_{eff} = [(\Delta_{SC})^2+(V_{CO})^2]^{1/2}$. Conductance maps of the Y-123 in finite fields demonstrate spatially varying spectra consistent with the periodicity a_0 of the vortex lattice, with pseudogap (PG) like features at $\sim V_{CO}$ inside the vortex core and SC gap features remaining at $\sim \Delta_{SC}$ outside the vortex core. Moreover, conductance histograms of the vortex state reveal that the ratio of the areas associated with Δ_{SC} and V_{CO} is comparable to $(a_0/\xi_{ab})^2$, (ξ_{ab}: in-plane SC coherence length). These results therefore suggest the important role of COs in the cuprate QP excitations. This work is supported by NSF Grant DMR-0405088.

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Date submitted: 30 Nov 2007 Electronic form version 1.4