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Spatially Resolved Quasiparticle (QP) Spectra in the Vortex State of Electron-Type Cuprate Superconductor (SC) $La_{0.1}Sr_{0.9}CuO_2$(La-112) M.L. TEAGUE, A.D. BEYER, M. GRINOLDS, N.-C. YEH, Phys Dept Caltech Pasadena, CA, S.I. LEE, Pohong U, Korea — The low-energy excitations of cuprate superconductors are unconventional and are susceptible to changes in temperature, doping and magnetic field. Our recent experiments and microscopic theoretical analysis suggest that these phenomena may be attributed to the presence of competing orders (COs) and strong quantum fluctuations. Here we present our scanning tunneling spectroscopic studies that support coexisting SC/CO in La-112, an optimally-doped electron-type cuprate with T_c=43 K. In zero-field, the histogram of the QP spectra at 9 K over an (100×100) nm^2 area reveals a single set of spatially homogeneous peaks at Δ_{eff} = 11.8±1.5 meV. Our analysis of the data (with two energy gaps of SC and CO, Δ_{SC} and V_{CO}) suggests $\Delta_{eff} = [(\Delta_{SC})^2+(V_{CO})^2]^{1/2}$, $\Delta_{SC} > V_{CO}$, and the presence of quantum fluctuations. With increasing magnetic field to 6 Tesla, Δ_{eff} shifts downward to 10.0 meV due to the overall suppression of Δ_{SC}, and the spatial variation of the spectra are consistent with vortex periodicity. Moreover, pseudogap-like spectral features occur at $\sim \pm V_{CO}$ inside the vortex cores while the spectra outside the vortex cores retain a gap value at $\sim \pm\Delta_{eff}$. This work was supported by NSF Grant DMR-0405088.

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