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Role of competing orders (COs) in the low-energy pseudogap (PG) phenomena and quasiparticle (QP) excitations of hole- and electron-type cuprate superconductors[1] A.D. BEYER, M.S. GRINOLDS, M.L. TEAGUE, N.-C. YEH, Phys. Dept., Caltech, Pasadena, CA, S.-I. LEE, Phys. Dept., Pohang U., Korea — Our cryogenic scanning tunneling spectroscopic studies of spatially resolved QP density of states (DOS) in hole-type $YBa_2Cu_3O_x$ and electron-type $La_{0.1}Sr_{0.9}CuO_2$ cuprate superconductors (SC) reveal that the existence of COs in the cuprates can account for many seeming non-universal phenomena. Namely, we analyze the low-energy QP excitation spectra by using a microscopic model of coexisting SC/CO, with density-wave type COs, and find that various spectral characteristics are uniquely determined by the parameters Δ_{SC}, V_{CO}, Q, η, and Γ (Δ_{SC}: SC gap, V_{CO}: CO gap, Q: CO wave-vector, η: strength of quantum fluctuations, Γ: line-width of QP spectral peak). For instance, $V_{CO} > \Delta_{SC}$ ($V_{CO} \leq \Delta_{SC}$) in hole- (electron-) type cuprates can account for the presence (absence) of the low-energy PG. Anomalous momentum-dependent QP properties such as the Fermi arcs and antiferromagnetic hot spots can also be explained. In finite magnetic fields, the QP DOS inside the vortex core of both types of cuprates reveal unconventional PG-like features at energies comparable to the V_{CO} values derived by our analysis.

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