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Studies of quantum fluctuations and competing orders on vortex dynamics in cuprate superconductors A.D. BEYER, C.R. HUGHES, N.-C. YEH, Physics Dept., Caltech, Pasadena, CA, V.S. ZAPF, L.A.N.L., Los Alamos, NM, M.-S. PARK, K.-H. KIM, S.-I. LEE, Pohang Univ., Korea — The existence of competing orders (CO) and the proximity to quantum criticality (QC) in cuprate superconductors create unconventional low energy excitations and significant quantum fluctuations (QF) which can alter the low temperature vortex dynamics of cuprates. We report studies on the effect of QF and CO on vortex dynamics in cuprates at low temperatures, focusing on the four-layer, hole-doped $HgBa_2Ca_3Cu_4O_x$ (Hg-1234). Hg-1234 has two underdoped inner layers that are anti-ferromagnetic and two optimally doped outer layers that are superconducting. Vortex phase diagrams, derived from 3^{rd} harmonic AC hall probe and high-field DC cantilever magnetization measurements, allow comparison of Hg-1234 with other cuprates such as $YBa_2Cu_3O_{7-x}$ and $La_{0.1}Sr_{0.9}CuO_2$. Comparison plots of the ab-plane reduced fields (normalized by the paramagnetic field, H_{para}), $h_{irr.}(t)=H_{irr.}(t)/H_{para}$and $h_{C2}(t)=H_{C2}(t)/H_{para}$ versus reduced temperature, t, demonstrate that QF and CO indeed affect Hg-1234 more than other cuprates, with Hg-1234 having the smallest extrapolated value of $h^* \equiv h_{irr.}(0) \approx 0.12$, indicating its closest proximity to QC.

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