Magnetization curves in underdoped cuprates measured at low T in fields up to 45 Tesla

LU LI, YAYU WANG¹, Physics Department, Princeton University, MIKE NAUGHTON, Boston College, S. ONO, YOICHI ANDO, Central Research Inst., Electric Power Industry, Tokyo, NAI PHUAN ONG, Physics Department, Princeton University — Torque magnetometry is capable of resolving the weak diamagnetic which extends to temperatures $T \gg T_c$ in hole-doped cuprate crystals. Recently, we reported¹ that the magnetization $M$ above $T_c$ scales accurately as the Nernst signal $e_N$ and remains robust to fields of 33 T. The results strongly support the scenario in which thermally created vortices destroy long-range phase coherence at $T_c$. We have extended these studies to explore the fluctuation magnetization to 45 T in underdoped LSCO and Bi 2201 in a series of samples doped near the critical value $x_c \sim 0.055$. We investigate the loss of phase coherence as we decrease $x$ below $x_c$ keeping $T$ as low as 0.5 K. We use the $M$-$H$ curves to explore how singular phase fluctuations occur as superfluidity is destroyed when $x$ approaches the insulating Mott limit at low $T$.

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