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

LU LI, YAYU WANG, 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 reported 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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