Inhomogeneous Fluctuating Superconductivity Near Room Temperature

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Over the past decade, a diverse set of experiments on high-transition temperature ($T_c$) cuprate superconductors have produced evidence for the existence of superconducting correlations on short time and/or length scales at temperatures well above the bulk $T_c$. This includes the discovery of an unusual magnetic-field induced effect in YBa$_2$Cu$_3$O$_y$ and La$_{2-x}$Sr$_x$CuO$_4$ above $T_c$ using an intense beam of spin-polarized muons at TRIUMF. The measurements show that an externally applied field induces a static internal magnetic field distribution at high temperatures far above $T_c$, and that the degree of field inhomogeneity is correlated with the bulk superconductivity that occurs below $T_c$. These findings indicate that non-uniform fluctuating superconductivity does survive in some samples at temperatures approaching room temperature. These experiments and the implications for room-temperature superconductivity will be discussed.

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