Introduction

A quantum critical point (QCP) has been postulated by a number of theories in an effort to explain the clearly unconventional mechanism of high-temperature superconductivity (HTS). Were such a QCP to exist then certain physical quantities must display clear signatures of the quantum critical behavior. However, the extreme robustness of HTS, together with thermal fluctuations in the normal state above superconducting transition temperature, $T_c$, has hidden such effects from conventional probes. To overcome these difficulties, we conduct direct measurements in the normal state of HTS cuprates in 60T magnetic field and low temperatures.

Results and Discussion

We have carried out exhaustive series of Hall effect and resistivity measurements in the normal state of the high-Tc superconductor La$_{2-x}$Sr$_x$CuO$_4$ (LSCO) in the magnetic-field-induced normal-state at low temperatures. The measurements were conducted at NHMFL Pulsed Field Facility. The thin film samples of LSCO were prepared by Pulsed Laser Deposition. Figure 1 displays normalized Hall number as a function of temperature and Sr doping, x, at high magnetic field in LSCO. Our most recent measurements firmly establish the presence of the prominent peak in Hall number near optimal Sr doping ($x\sim0.16$), which is most readily associated with the dominance of quantum fluctuations once the doping is tuned close to QCP at low temperatures.

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