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**Anomalous critical behavior near the quantum critical point of a hole-doped $La_2CuO_4$** WEI BAO, Los Alamos National Laboratory, YING CHEN, University of Maryland/NIST, EMILIO LORENZO, CNRS, France, ANNE STUNAULT, Institut Laue-Langevin, France, JOHN SARRAO, Los Alamos National Laboratory, SUNGIL PARK, Korea Atomic Energy Research Institute, YIMING QIU, University of Maryland/NIST — In zero temperature quantum critical phenomena, classical thermal fluctuations are replaced by zero-point quantum critical phenomena and quantum mechanical generalization of the Landau-Ginzburg- Wilson paradigm has been a central topic in condensed matter physics. In Sr or Ba-doped $La_2CuO_4$, which is a member of high-Tc superconducting cuprates, the energy spectra of spin fluctuations in the neighborhood of the $(\pi, \pi)$ antiferromagnetic Bragg point have been shown to follow the $E/T$ scaling. In the neutron scattering study on spin dynamics in $La_2Cu_{1-x}Li_xO_4$, we find that the critical exponent $a$ in the $E/T$ scaling changes from an expected $a \approx 1$ to an anomalous $a \approx 0.65$ and the scaling function becomes anomalous when the doping is reduced towards the antiferromagnetic quantum critical point, which has not been expected in the current theories.[1] Our results suggests extra physics which is beyond mapping the 2-dimensional quantum spin system to a 3 dimensional one in classical Landau-Ginzburg-Wilson theory.
[1] Y. Chen *et al.*, cond-matt/0408547

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