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Experimental phase boundary between quantum critical and quantum disordered regime in hole-doped La_2CuO_4 YING CHEN, University of Maryland/NIST, WEI BAO, Los Alamos National Laboratory, 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 — The long-range antiferromagnetic order in La_2CuO_4 is suppressed by hole doping at $x_c \approx 3\%$ of Li dopant concentration. This allows experimental investigation of the spin fluctuations near the quantum critical point of a 2-dimensional S=1/2 antiferromagnet. According to quantum critical theory, the quantum critical (QC) E/T scaling is expected to break down and crosses over to a constant energy quantum disordered (QD) scaling at low temperatures when the doping $x > x_c$. In this single crystal inelastic cold neutron scattering study on spin dynamics of $La_2Cu_{1-x}Li_xO_4$ ($0.04< x <0.1$), the phase boundary for the crossover between the QC and the QD regime is observed for the first-time for a cuprate.[1,2] Furthermore, there is no detectable gap in the low temperature constant energy scaling regime, which put constraint on theoretical model of quantum antiferromagnet for cuprates. [1] Y. Chen *et al.*, cond-matt/0408547 [2] W. Bao *et al.*, Phys. Rev. Lett. **91**, 127005 (2003).

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