Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Disappearance of antiferromagnetic spin excitations in overdoped $\mathbf{La_{2-x}Sr_xCuO_4}$ JOHN TRANQUADA[1], Brookhaven National Lab, S. WAKIMOTO, Japan Atomic Energy Agency, K. YAMADA, IMR, Tohoku Univ., C.D. FROST, ISIS Facility, RAL, R.J. BIRGENEAU, UC Berkeley, H. ZHANG, Univ. of Toronto — We have used time-of-flight neutron spectroscopy to study magnetic excitations, for energies up to ∼100 meV, in overdoped $La_{2-x}Sr_xCuO_4$ with x = 0.25 and 0.30 [1]. Comparison of spectra integrated over the width of an antiferromagnetic Brillouin zone demonstrates that the magnetic scattering at intermediate energies, $20< \omega <100$ meV, progressively decreases with overdoping. Previous work has shown that the low-energy magnetic excitations also disappear with overdopoing [2]. This strongly suggests that the magnetism is a vestige of the parent antiferromagnet; spatial segregation of the doped holes, as in the stripe picture, provides a natural way for this to occur. Both the magnetism and superconductivity disappear as the system becomes a homogeneous metal. [1] S. Wakimoto *et al.*, Phys. Rev. Lett. **98**, 247003 (2007). [2] S. Wakimoto *et al.*, Phys. Rev. Lett. **92**, 217004 (2007).

[1]Supported by Office of Science, US DOE, under Contract No. DE-AC02-98CH10886.

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Date submitted: 30 Nov 2007 Electronic form version 1.4