Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Searching for orbital currents in the pseudo-gap state of $La_{2-x}Sr_xCuO_4$ G.J. MACDOUGALL, G.M. LUKE, A.A. ACZEL, J. RODRIGUEZ, McMaster University, Y.J. UEMURA, J.P. CARLO, T. ITO, Columbia University, P.L. RUSSO, TRIUMF, S. WAKIMOTO, University of Toronto — Among the many outstanding riddles involving the cuprate materials is the microscopic nature of the so-called 'pseudo-gap state'. Several theories have been put forth over the years, including pre-formed pairs, superconducting fluctuations and several brands of unconventional order. An example of the latter which has been getting particular attention of late is the idea that the pseudo-gap corresponds to an ordering of orbital currents. This renewed debate is mostly due to recent polarized neutron data on $YBa_2Cu_3O_{7-\delta}$, which claims to support a current ordered state which does not break translational invariance [PRL 96, 197001 (2006)]. These neutron results are not universally accepted, however, and clarifying experiments are necessary. In this spirit, we performed zero-field μSR on $La_{2-x}Sr_xCuO_4$ crystals with a wide range of T^* values, and searched for the sponteous magnetic fields that would necessarily be associated with current order. We present the results of this search and discuss the implications our data for the interpretation of past and future experiments.

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Date submitted: 20 Nov 2006 Electronic form version 1.4