Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Microscopic Ferromagnetic and Antiferromagnetic Clusters in $\mathbf{Pr}0.7\mathbf{Ca}_{0.3}\mathbf{MnO}_3$ HAO SHA, JIANDI ZHANG, Florida Intl. Univ., FENG YE, JAIME FERNANDEZ-BACA, ORNL, PENGCHENG DAI, Univ. of Tenn. and ORNL, Y. TOMIOKA, CERC, Japan, Y. TOKURA, Univ. of Tokyo and CERC, Japan — "Colossal" magnetorestive manganite $Pr_{0.7}Ca_{0.3}MnO_3$ (PCMO30) is an ideal system to test the microscopic phase separation scenario because it has an inhomogeneous low-temperature insulating metastable state where ferromagnetic (FM), antiferromagnetic (AF), and charge/orbital (CO-OO) phases coexist. On cooling from room temperature, a CO-OO state occurs below T_{CO-OO} ~200 K, followed by AF ordering below T_N ~140 K. Below T_C ~110 K, the magnetic structure develops a FM component coexisting with AF ordering. We have used neutron scattering to study FM, AF and CO-OO phase transitions in a single-crystal PCMO30. The diffuse scattering of FM component demonstrates the presence of short-range ferromagnetic clusters both above and below T_C, while no diffuse component in the CO-OO scattering peaks has been observed near T_{CO-OO}. Interestingly, the short-range AF correlations associated with Mn^{4+} sites but not with Mn^{3+} sites are observed for both above and below T_N, indicating that the local AFM clustering is directly associated with doped holes in this system. The work was supported by NSF-DMR0453804, NSF-DMR0346826, DE-FG02-05ER46202, and DOE DE-FG02-04ER46125. ORNL is managed by UT-Battelle, LLC, for the U.S. DOE under contract DE-AC05-00OR22725.

Hao Sha
Florida International University

Date submitted: 01 Dec 2005 Electronic form version 1.4