Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Antiferromagnetic Spin Waves and Pr Crystal Field Excitations in $Pr_{0.5}Sr_{0.5}MnO_3$ V. V. KRISHNAMURTHY, J. L. ROBERTSON, M. D. LUMSDEN, CMSD, Oak Ridge National Laboratory, G. J. MANKEY, MINT, The University of Alabama, J. F. MITCHELL, MSD, Argonne National Laboratory — Neutron scattering investigations reveal three interesting features of antiferromagnetism in the doped manganite $Pr_{0.5}Sr_{0.5}MnO_3$. The intensity of the (0.5 0 0.5) antiferromagnetic (AF) Bragg peak shows that the AF domains exist between 150 and 190 K in the ferromagnetic state. The spin wave dispersion of the Mn sublattice measured at 20 K in the wave vector range of (0.5 0 0.5) to (2 0 2) along the AF coupling direction could be well described by the Heisenberg model with nearest neighbor exchange interactions and single-ion anisotropy. The AF coupling and the single ion anisotropy energy of $Pr_{0.5}Sr_{0.5}MnO_3$ are comparable to those found in $LaMnO_3$, suggesting the same of order of magnitude of the gap in the dispersion at the zone center. The ferromagnetic coupling of $Pr_{0.5}Sr_{0.5}MnO_3$ is smaller by a factor of 3 as compared to that of $LaMnO_3$ resulting in a smaller amplitude of the spin waves in the former. Pr crystalline field (CF) excitations in the AF state are found to be different from those in the ferromagnetic state suggesting the renormalization of at least one CF excitation of Pr due to an interaction with the spin waves of Mn near the zone boundary. Funded by DOE.

Vemuru Krishnamurthy
Oak Ridge National Laboratory

Date submitted: 01 Dec 2004 Electronic form version 1.4