Abstract Submitted for the MAR07 Meeting of The American Physical Society

Role of oxygen in the orbital ordered state of $La_{0.5}Sr_{1.5}MnO_4$ JOHN W. FREELAND, Advanced Photon Source, Argonne National Laboratory, MICHEL VAN VEENENDAAL, Department of Physics, Norther Illinois University, KEN GRAY, QING'AN LI, HONG ZHENG, JOHN F. MITCHELL, Materials Science Division, Argonne National Laboratory — In the single layer manganite, $La_{0.5}Sr_{1.5}MnO_4$, experimental evidence points clearly to formation of orbital ordering but leaves the question open as to the exact nature of the state. Using oxygen K edge spectroscopy, we find that oxygen holes related to the Mn-O hybridization between O(2p) and $Mn(e_g)$ states play an important role in the formation of the ordered groundstate. The large change in the number of e_q related oxygen holes with the formation of the charge/orbital ordered states demonstrates it is not due to a locking in of orbitals which are fluctuating in orientation, but that the disordered state possesses a different orbital occupancy. The change in the number of e_q holes occurs mainly within the ab plane and seems to be related to the crossover from ferromagnetic to anti-ferromagnetic correlations with the onset of the charge/orbital ordered state. This idea is supported by Mn_4O_8 cluster calculations. Work at Argonne is supported by the U.S. Department of Energy, Office of Science, under Contract No. DE-AC02-06CH11357.

> John W. Freeland Advanced Photon Source, Argonne National Laboratory

Date submitted: 19 Nov 2006

Electronic form version 1.4