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Role of Oxygen Electrons in the Metal-Insulator Transition in the Mangnetoresistive Oxide $La_{2-2x}Sr_{1+2x}Mn_2O_7$ W. AL-SAWAI, B. BARBIELLINI, Northeastern U. (NU), A. KOIZUMI, U. Hyogo, P.E. MIJNARENDS, Delft U. of Tech. & NU, T. NAGAO, U. Hyogo, K. HIROTA, Osaka U., M. ITOU, JASRI (SPring-8), Y. SAKURAI, SPring-8, A. BANSIL, NU — We have studied the [100]-[110] anisotropy of the Compton profile in the bilayer manganite. Quantitative agreement is found between theory and experiment with respect to the anisotropy in the two metallic phases (i.e. the low temperature ferromagnetic and the colossal magnetoresistant phase under a magnetic field of 7T). Robust signatures of the metal-insulator transition are identified in the momentum density for the paramagnetic phase above the Curie temperature. We interpret our results as providing direct evidence for the transition from the metallic-like to the admixed ionic-covalent bonding accompanying the magnetic transition. The number of electrons involved in this phase transition is estimated from the area enclosed by the Compton profile anisotropy differences. Our study demonstrates the sensitivity of the Compton scattering technique for identifying the number and type of electrons involved in the metal-insulator transition. Work supported in part by the USDOE.

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