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**Soft x-ray investigation on the spin and orbital states of  $\text{La}_{1.4}\text{Sr}_{1.6}\text{Mn}_2\text{O}_7$**  K.-T. KO, H. JANG, J.-H. PARK, Dept. Physics, POSTECH, B.-G. PARK, J.-Y. KIM, PAL, SUNG BAEK KIM, I-FEM & Dept. Physics, POSTECH, S-W. CHEONG, R-CEM & Dept. Physics and Astronomy, Rutgers University — The spin and orbital states of  $\text{La}_{1.4}\text{Sr}_{1.6}\text{Mn}_2\text{O}_7$  was investigated by using the x-ray absorption spectroscopy (XAS) and the soft x-ray resonant scattering (SXRS) at Mn  $L_{2,3}$ -edge. The field induced spin reorientation transition was observed by SXRS. The polarization dependent analysis revealed that the AFM spin axis changes from out-of-plane to in-plane axis. Additionally, the orbital states were determined from the polarization dependent XAS and CI model calculation, where the orbital state were changed by cooling temperature and external magnetic field. Here, the orbital states of low temperature ferromagnetic and field induced ferromagnetic are identical. Finally, we discuss the magnetoelastic coupling including spin and orbital structure of  $\text{La}_{1.4}\text{Sr}_{1.6}\text{Mn}_2\text{O}_7$ .

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