

## Poster Presentation

**MS26.P01**

### *Study La<sub>0.5</sub>Sr<sub>1.5</sub>MnO<sub>4</sub> with Multi-Beam X-ray Diffraction*

W. Liu<sup>1</sup>, Y. Chiu<sup>1</sup>, P. Liao<sup>1</sup>, C. Cheng<sup>1</sup>, Y. Tsai<sup>1</sup>, C. Chu<sup>2</sup>, S. Chang<sup>2</sup>

<sup>1</sup>Department of Physics, National Tsing Hua University, Hsinchu, Taiwan, <sup>2</sup>National Synchrotron Radiation Research Center, Hsinchu, Taiwan

We have used resonant multi-beam diffraction with the primary reflections  $G=(h/2 \ h/2 \ 0)$  and  $G=(h/4 \ h/4 \ 0)$  ( $h$  is an odd number) to investigate the charge ordering and Jahn-Teller distortion, respectively, in La<sub>0.5</sub>Sr<sub>1.5</sub>MnO<sub>4</sub> low temperature phase. While the Renninger scans with  $G=(h/2 \ h/2 \ 0)$  shows several Aulfhellung-type four-beam diffraction, most of the multi-beam diffraction with  $G=(h/4 \ h/4 \ 0)$  has an Umweganregung-type nature. A detailed study of multi-beam diffraction anomalous fine structure (M-DAFS) of  $(0 \ 0 \ 0)/(3/2 \ 3/2 \ 0)/(1 \ -1 \ 0)/(5/2 \ 1/2 \ 0)$  OUT diffraction is carried out. Its triplet invariant phase approach 180° when the x-ray energy is tuned away from manganese K-edge, and approach 90° when the x-ray energy is tuned on manganese K-edge. In other words, its multi-beam diffraction profile shows strong asymmetry when  $(3/2 \ 3/2 \ 0)$  diffraction intensity is dominated by Jahn-Teller distortion, and becomes more symmetric when charge ordering dominated. This characteristic can be successfully simulated by tensor form dynamical x-ray diffraction theory accompanied with FDMNES software [1] calculations.

[1] O. Bunau and Y. Joly, *J. Phys.: Condens. Matter* 21, 345501 (2009).

**Keywords:** Multi-beam X-ray Diffraction, La<sub>0.5</sub>Sr<sub>1.5</sub>MnO<sub>4</sub>