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Orbital Ordering in Magnanites Probed with Soft X-Ray Scattering STUART WILKINS, Brookhaven National Laboratory, NATASA STOJIC, Abdus Salam International Centre for Theoretical Physics, THOMAS BEALE, University of Durham, NADIA BINGELI, Abdus Salam International Centre for Theoretical Physics, PETER HATTON, University of Durham, D. PRABHAKARAN, ANDREW BOOTHROYD, University of Oxford, MASSIMO ALTARELLI, Abdus Salam International Centre for Theoretical Physics — Orbital ordering is important in the understanding of transition metal oxides as the magnetic and transport properties are strongly related to the orbital and charge degrees of freedom. In the case of $La_{0.5}Sr_{1.5}MnO_4$ we will present results using diffraction at the L-edges of Mn, for the orbital order superlattice relfection, and show that while there indeed does exist long range order of the orbitals the dominant process is cooperative Jahn-Teller distortions. By comparing these measurements with theoretical calculations we find a good general agreement showing a dominant orbital ordering of the $d_{x^2-z^2}/d_{y^2-z^2}$ type, in contrast to the $d_{3x^2-r^2}$ / $d_{3y^2-r^2}$ as previously proposed. In $LaSr_2Mn_2O_7$, which is found crystallographically to have virtually no Jahn-Teller distortion of the oxygen octahedra. We will show that even in the absence of Jahn-Teller distortions, this compound is strongly orbitally ordered. Fitting of the Mn L-edge resonance spectra demonstrates the presence of orbital ordering of the Mn^{3+} ions within an almost cubic crystal field.

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