ESRF	**Experiment title:** *Coherent Soft X-ray Diffraction from Orbital and Jahn-Teller Domains*	**Experiment number**: HE1645
Beamline: ID08	**Date of experiment**: from: 10/11/2004 to: 16/11/2004	**Date of report**: 27/2/2005
Shifts: 18	**Local contact(s)**: Dr. Stefan STANESCU	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Dr. Stuart B. Wilkins – EITU, Karlsruhe, Germany and ESRF

Prof. Peter D. Hatton – University of Durham, UK

Mr. Thomas A. W. Beale – University of Durham, UK

Report:

Due to technical problems with the diffractometer and the unavaliability of a suitable CCD camera the time (after discussion with beamline staff). We therefore used the beamtime to conduct a soft X-ray diffraction experiment on the bilayer sample $LaSr_2Mn_2O_7$. This experiemnt resulted in excellent data. A paper on this experiment has been submitted to *The Physical Review Letters* and a copy of the abstact is below.

Abstract: (Preprint at cond-mat/0412435)

Resonant soft x-ray diffraction has been used to probe the orbital and magnetic structure of $LaSr_2Mn_2O_7$ at low temperatures. Previous crystallographic studies have shown that this material has almost no MnO_6 oxygen displacements due to the Jahn-Teller distortions. Within the A-type antiferromagnetic phase we found strong intensity at the \oo\ orbital and \af\ magnetic reflections. This shows that even in the absence of Jahn-Teller distortions, this compound is strongly orbitally ordered. The fit to the orbital spectrum shows the absence of the Jahn-Teller distortion. 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 in addition to valence fluctuations of a Mn^{3+} and Mn^{2+} type.