ESRF	**Experiment title:** Soft X-ray Resonant Diffraction of $Nd_{1-x}Sr_xMnO_4$; x=2/3,3/4	**Experiment number**: HE-1637
Beamline: ID08	**Date of experiment**: from: 13 July 2004 to: 19 July 2004	**Date of report**: 26 Feb 2005
Shifts: 18	**Local contact(s)**: Dr Peter BENCOK	*Received at ESRF:*

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Report:

This experiment was awarded to look at charge ordering in $Nd_{1-x}Sr_xMnO_4$. The doping of these crystals needed to be at least $x = 0.7$ in order for the charge order reflection to be inside the Ewald sphere. Unfortunately although we had studied these crystals previously, using both high energy x-rays and resonant *K* edge diffraction, the (¼, ¼, 0) charge order peak was not observable. We believe this is probably caused by compositional variations in the sample crystal.

In order to make use of the beamtime, we instead studied $La_{1-x}Sr_xMnO_4$ with $x = 0.5$. As a result of this study we currently have a PRB in press (also on cond. mat. 0410713).

The following is the abstract of this paper, entitled *Resonant Soft X-ray Scattering Investigation of Orbital and Magnetic Ordering in* $La_{0.5}Sr_{1.5}MnO_4$ by Wilkins *et al*.

Abstract:

We report resonant x-ray scattering data of the orbital and magnetic ordering at low temperatures at the Mn $L_{2,3}$ edges in $La_{0.5}Sr_{1.5}MnO_4$. The orderings display complex energy features close to the Mn absorption edges. Systematic modeling with atomic multiplet crystal field calculations was used to extract meaningful information regarding the interplay of spin, orbital and Jahn-Teller order. These calculations provide a good general agreement with the

observed energy dependence of the scattered intensity and indicate the dominant orbital ordering is of the $d_{x^2-y^2}/d_{y^2-x^2}$ type. In addition, the origins of various spectral features are identified. The temperature dependence of the orbital and magnetic ordering was measured and displays a strong interplay between the magnetic and orbital order parameters.