



Experiment title: XRS Studies of multiferroic HoMnO₃ in applied electric fields.

Experiment number:
28 01 780

Beamline: BM28	Date of experiment: from: to:	Date of report: 06/05/08
Shifts: 18	Local contact(s): D. Mannix	<i>Received at ESRF:</i>

Names and affiliations of applicants (* indicates experimentalists):

Danny Mannix XMaS UK CRG Beamline

P. Thompson XMaS UK CRG beamline.

Andrew Boothroyd, University of Oxford, UK

Des McMorroUCL, London, UK.

Report:

The aim of this proposal was to investigate multiferroic HoMnO₃ in electric field, which have been proposed to switch the magnetism from antiferromagnetic to ferromagnetic. This experiment was to take advantage of ferromagnetic studies using XRS techniques which have been developed on the XMaS beamline. In the first instance of trying to investigate the antiferromagnetic structure these experiments failed due to the huge amount of multiple scattering observed at resonance for this hexagonal structure. Every possible position of Bragg space investigated was found to be contaminated with multiple scattering. This effect has been seen subsequently in other systems with this same hexagonal structure.

The second part of the experiment we have investigated the ferromagnetic signal in applied electric fields. However, these measurements also failed to observe a switching of ferromagnetism reported for this material. One possibility for this is that not enough electric field was applied to the material to observe this effect. We were only able to apply fields up to 2kV during the experiment. Subsequent developments at XMaS enabling the investigation of ferroelectricity by PE loops indicate that these fields may not be enough to saturate the ferroelectric moments. Further experiments are planned on this material on XMaS with the arrival of a new cryostat in which applied fields of 10kV are possible.