



	Experiment title: Unravelling magnetic order of Dy and Mn in multiferroic DyMn ₂ O ₅	Experiment number: 28-01 799
Beamline: BM28	Date of experiment: from: 4 April 2007 to: 10 April 2007	Date of report: 19 Dec 2010
Shifts: 18	Local contact(s): D. Mannix	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): Prof Andrew Boothroyd (Oxford University, UK) *Mr Russell Ewings (Oxford University, UK) Prof Des McMorrow (UCL, London, UK) Dr Danny Mannix (XMaS CRG, ESRF, France)		

Report:

The results from this experiment were published in the following paper:

R.A. Ewings, A.T. Boothroyd, D.F. McMorrow, D. Mannix, H.C. Walker and B.M.R. Wanklyn, Phys. Rev. B **77**, 104415 (2008).

Abstract:

X-ray resonant scattering has been used to measure the magnetic order of the Dy ions below 40 K in multiferroic DyMn₂O₅. The magnetic order has a complex behavior. There are several different ordering wave vectors, both incommensurate and commensurate, as the temperature is varied. In addition a nonmagnetic signal at twice the wave vector of one of the commensurate signals is observed, the maximum intensity of which occurs at the same temperature as a local maximum in the ferroelectric polarization. Some of the results, which bear resemblance to the behavior of other members of the RMn₂O₅ family of multiferroic materials, may be explained by a theory based on so-called acentric spin-density waves.

The main results are the temperature dependence of the magnetic ordering vectors shown in Figs. 1 and 2.

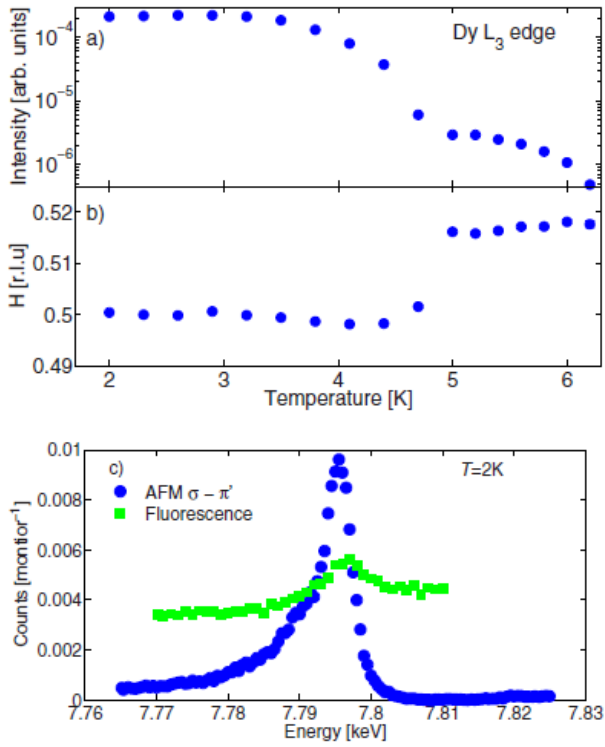


Fig. 1. Lower panel: the resonance lineshape at the Dy L_3 edge for a wavevector of $(0.5,0,0)$. Upper panel: temperature dependence of the intensity and wavevector of the $(0.5,0,0)$ Dy magnetic order peak.

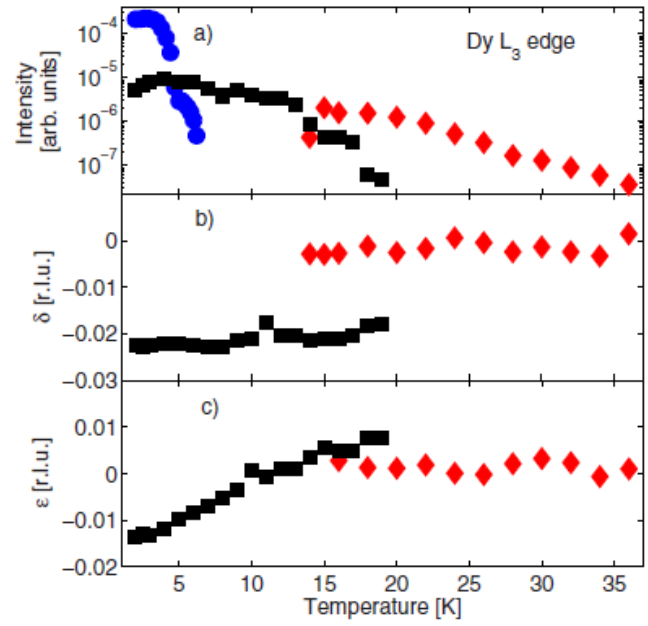


Fig. 2. Temperature dependence of the intensity and incommensurability of the $(-0.5+\delta, 0, 0.25+\epsilon)$ peak associated with Mn magnetic order.