Experimental report

23/03/2016

Proposal: 5-32-806 **Council:** 10/2014

Title: Short-range magnetic ordering in La3Ni2SbO9

Research area: Physics

This proposal is a new proposal

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Samples: La3Ni2SbO9

Instrument	Requested days	Allocated days	From	To
D7	4	4	30/04/2015	04/05/2015

Abstract:

We have previously suggested that La3Ni2SbO9 is a relaxor ferromagnet, i.e a magnetic analogue of the well-known, perovskite-related relaxor ferroelectrics. The purpose of the proposed experiment is to study the magnetic diffuse scattering from La3Ni2SbO9 in order to find evidence for the onset of short-range magnetic ordering just above and then below the Curie temperature (100 K).

The aim of this experiment was to identify short-range ordering, both structural and magnetic, amongst the Ni^{2+} and Sb^{5+} cations that occupy the six-coordinate sites in the perovskite-related compound $La_3Ni_2SbO_9$. This mixed-metal oxide is ferromagnetic below 108 K.

We collected data with a view to performing an analysis using the XYZ and/or the 10-point method. This involved collecting calibration data using the empty aluminium can, cadmium, vanadium and quartz at a wavelength of 4.853Å. This occupied a total of 24 h. The remaining time was used to collect data at 5 K, 80 K, 110 K, 125 K, 175 K, 225 K and 275 K, i.e. above and below the Curie temperature. Each data collection ran for 6 hours except those at 225 K and 275 K which were extended to run for (3 x 3) = 9 hours. This repetition was performed partly to improve the counting statistics and partly because we were concerned that one of the detectors was giving inconsistent data.

Quantitative analysis of the data is still in progress. However, Figure 1 below shows a feature at Q ~0.75 $Å^{-1}$ that indicates the presence of short-range atomic ordering and Figure 2 shows a feature at Q = 1.25 $Å^{-1}$ that demonstrates the presence of short-range magnetic ordering at 175 K, well above the Curie temperature of 108 K. We are confident that our ongoing analysis will lead to a quantitative interpretation of these features.

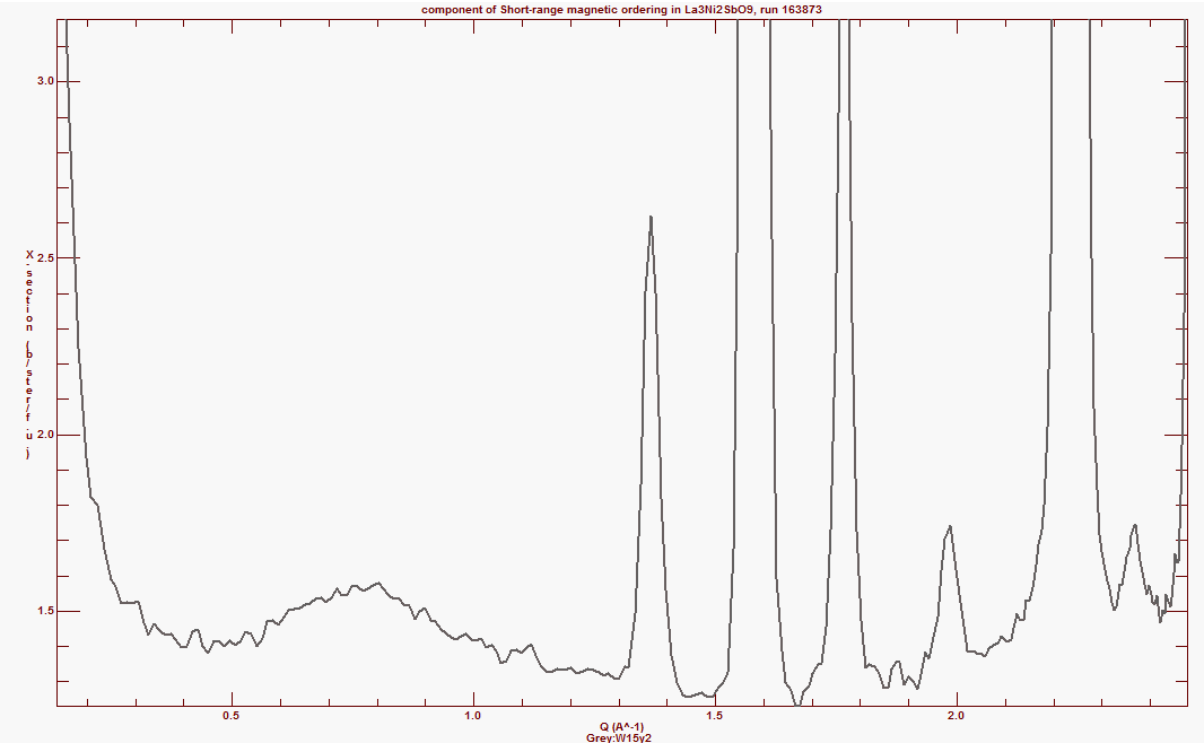

Figure 1

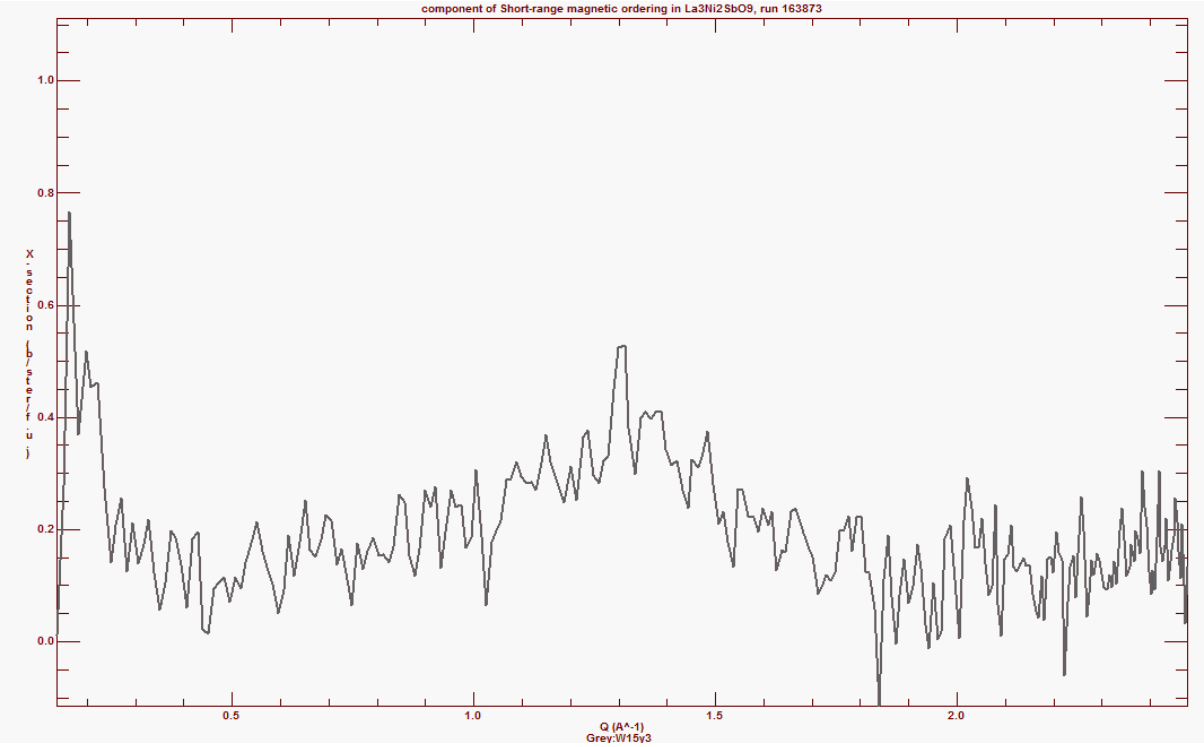

Figure 2