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| ESRF | **Experiment title:**<br>On the nature of the magnetoelectric effect in the Kagome staircase compound Ni3V2O8 | **Experiment number**:<br>HE2173 |
| **Beamline**: | **Date of experiment**:<br>from: 14 June 2006 to: 19 June 2006 | **Date of report**:<br>31/8/2006 |
| **Shifts:** | **Local contact(s)**:<br>Luigi Paolasini | *Received at ESRF:* |


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**Report:**

Ni3V2O8 is a recently discovered multiferroic, displaying both long-range magnetic and ferroelectric order. The aim of the present experiment was to use x-ray resonant scattering (XRS) to shed further light on the correlation between magnetism and structure in this compound.

Overall the experiment can be judged to have been partially successful. Scattering was found at one of the positions in reciprocal space, (3+q,1,0) where incommensurate magnetic order had been identified in an earlier neutron experiment. However, the transitions in Ni3V2O8 occur at low temperature below 10 K. It was found in the experiment on ID20 that there was severe beam heating of the sample, requiring that the beam be attenuated by a factor of up to 50. This reduced the signal count rate to around 1 count per second in the detector. Although this was a serious handicap we still succeeded in obtaining some useful data.

Fig. 1 shows the energy dependence of the XRS at (3+q,1,0) where a sharp resonance is clearly evident in the $\sigma \rightarrow \pi$ channel. The resonance is positioned well below the main edge allowing it to be ascribed to either an E2-E2 or E1-E2 process. We also succeeded in measuring the azimuthal dependence of this peak as shown in Fig. 2. Understanding the origin of these features will require detailed modelling using the FDMENS code, but when complete we expect it to provide important information on the interplay of magnetism and structure in this interesting material.

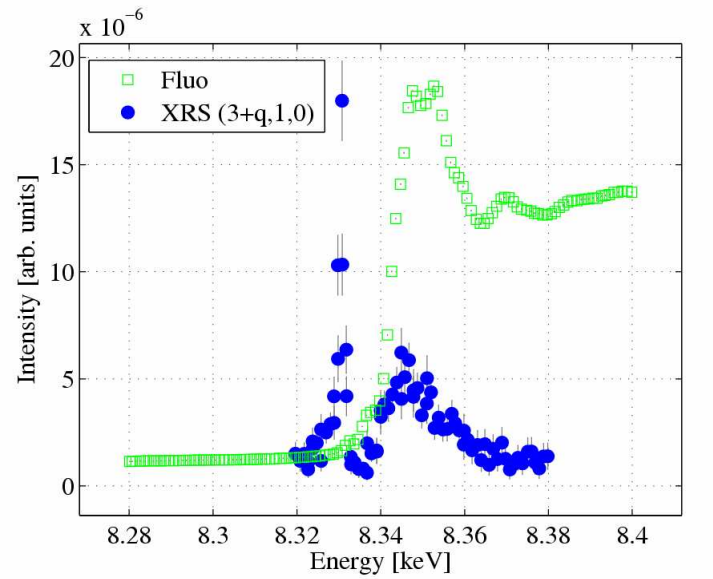


Fig. 1: Energy scans. The XRS shows a sharp resonance in the near edge region. The broad peak between 8.34 and 8.36 is due to leakage of the fluorescence through the analyser.

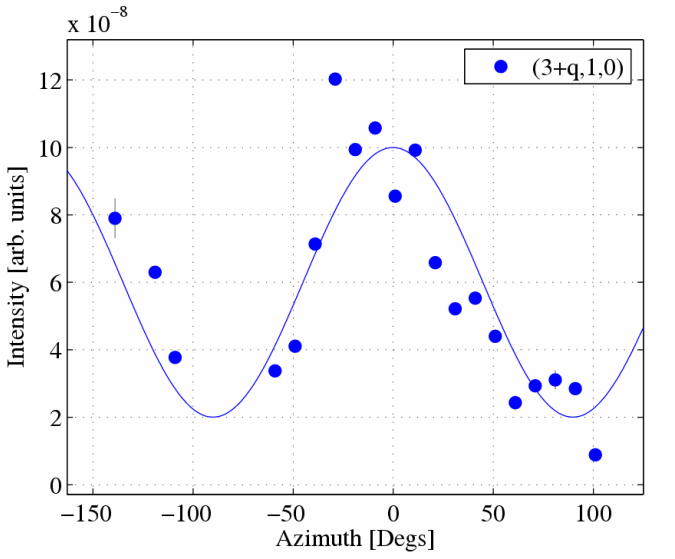


Fig. 2: Azimuthal dependence of the (3+q,1,0).