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ESRF	**Experiment title:** ME effect in multiferroic LiCu2O2	**Experiment number**: HE 2590
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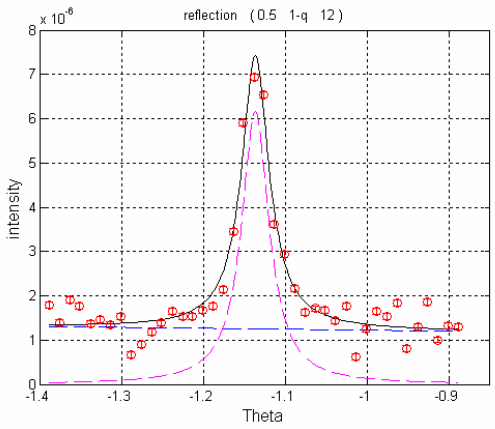
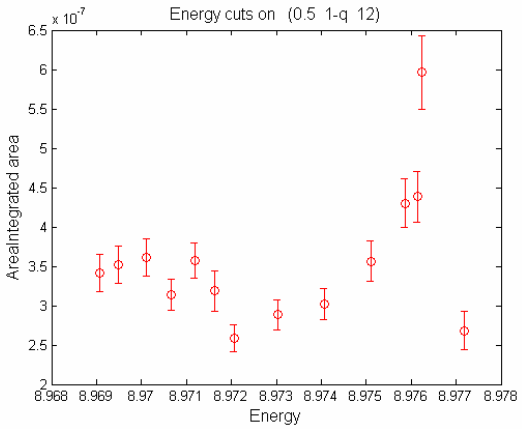
Report:

A recent research activity is focussed on the study of the linear magnetoelectric (ME) effect, namely, the induction of magnetisation by an electric field or polarisation by a magnetic field. Ideal candidates to display a considerable ME effect are those multiferroics compounds where a noncentrosymmetric magnetic order causes lattice relaxation, so inducing ferroelectricity [1].

$LiCu_2O_2$ (*Pnma)* is an example of one-dimensional spiral magnet that is also ferroelectric (T_N = 23 K). Magnetic superlattice peaks with propagation vector (0.5, 0.826, 0) have been measured from neutron scattering at 1.5 K [2].
However, no X-ray investigation of the magnetic structure had been done up to now. This experiment has been conceived with the aim of exploiting X-ray diffraction in the resonant regime (Cu K edge), to recover information about those geometrical features of the magnetic structure that are still unclear. In particular, the plane where moments lie is controversial, on comparing the neutron data with recent studies on the electric polarisation [2, 3, 4].

Whilst several magnetic reflections have been measured, the main difficulty faced during the experiment has been the extremely weak nature of the resonance, which necessitated long counting rates to collect suitable data. This has also prevented us from performing more sophisticated analysis techniques on the diffracted beam, such as polarimetry measurements.





Here we show one of the collected superlattice magnetic reflections, as well as the the energy dependence: it can be seen that the resonance is extremely weak; a more detailed data analysis is ongoing.
This suggests for the future that it might be preferential to perform the experiments in the non-resonant regime. In fact, the resonance is presumably strongly affected by interference from the non-resonant signal, while the latter is more directly related to the spin and orbital magnetization densities, and comparable with the neutron data.

[1]. Fiebig, J. Phys. D: Appl. Phys. 38, R123-R152 (2005)
[2] T. Masuda et al., Phys. Rev. Lett. 92, 177201 (2004)
[3] T. Masuda et al., Phys. Rev. B 72, 014405 (2005)
[4] S. Park et al., Phys. Rev. Lett. 98, 057601 (2007)