	Experiment title:	Experiment number:
ESRF	Azimuthal dependence of magnetic reflections in NpP	HE-1386
Beamline: ID20	**Date of experiment**: from: 26/11/2003 to: 02/12/2003	**Date of report**: 20/1/2004
Shifts: 18	**Local contact(s)**: Dr S. B. Wilkins	*Received at ESRF:*

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Report:

Neptunium phosphide crystallizes into the rock salt fcc structure. It is amongst a family of similar compounds of the general form NpX (where X is a pnictide), which display a plethora of magnetic structures. We have carried out magnetic scattering experiments on ID20 to confirm the type of magnetic structure. Unfortunately, due to technical problems with the ID20 cryostat before the experiment we were unable to measure the temperature dependence of the magnetic reflections or reach the incommensurate phase.

Azimuthal dependence of the specular (0 0 7/3) and off specular (1/3 0 2) reflections was measured, which confirmed the single-k structure with moments aligned along the [001] direction. This can easily be seen as the azimuthal dependence of the (0 0 7/3) is flat indicating that the azimuthal rotation occurs around the moment direction.

The main aim of the experiment was, however, to investigate the origin of the **2k** reflections that had been found previously,[1] returning with polarization analysis and the ability to perform azimuthal scans with transuranium samples. Such measurements are very important and provide for much more information which has allowed us previously to distinguish between magnetic dipole and higher order ordering. The azimuthal dependence of the (0 0 8/3) reflection was measured and was found not to vary with azimuthal angle, as expected. We were unable to locate any off specular reflections of the form (2/3 0 2) or (0 2/3 2). We then returned to the specular reflections. The (0 0 8/3) was found to resonate at the Np M_4 edge, but was also found to exist at an incident energy of 12 keV. We therefore conclude that this class of reflections are due to a structural distortion of the lattice caused by the antiferromagnetic order. The resonance can be explained by the large variation in f' and f'' upon crossing the absorption edge, resulting in a large enhancement of the charge scattering.[1]

1: M. J. Longfield et al., Phys. Rev. B