ESRF	**Experiment title:** A Compton scattering study of spin moments in single crystal Pd_xCo_{1-x}, Pd_3Ni and Pd_3Fe alloys	**Experiment number:** HE-381
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Report:

This is a preliminary report on experiment HE-381, which we completed last month. Because we have only just finished the experiment, the analysis is still in progress. Here, we present our inital results, but the corrections such as for multiple scattering have not been applied. In the experiment we measured the l-dimensional projection of the momentum space spin density of PdCo and Pd_3Co, using magnetic Compton scattering. The objective of the work is to understand the interactions present in these alloys, where a spin moment is induced on the Pd conduction electrons, resulting in a large moment in the alloys. The magnetic interactions are of interest for they also lead to physical properties such as a large Kerr effect, and, in multilayer form, these properties are of importance to information technology. Magnetic Compton scattering provides a method of studying the underlying spin-dependent electron structure responsible for such behaviour.

The experiment was conducted successfully, and the results are presented in figures 1 and 2. The magnetic Compton profiles are a measure of the integrated momentum space spin density, with the directions resolved indicated on the figures. In figure 1, the MCPs of the three main crystallographic directions of PdCo are shown, offset for clarity. The integrated area under each profile is the proportional to the sample's total spin moment, and with

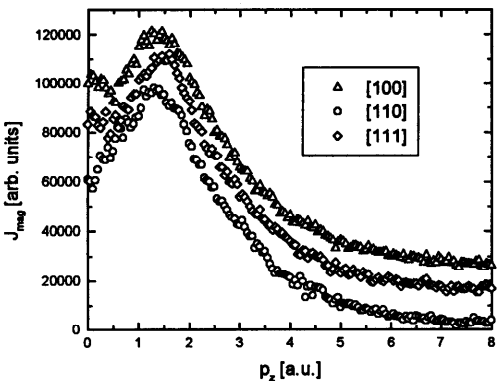

Figure 1. MCPs for PdCo

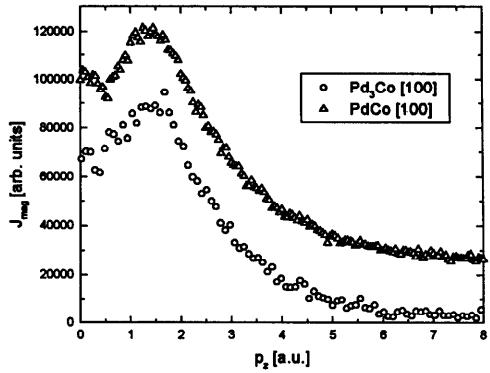

Figure 2. The MCP for Pd3Co [100], with the PdCo [100] profile presented in figure 1.

normalisation, the absolute moment can be found: this will be possible when the analysis is complete. Considering the general shape of the profiles, the tails (i.e. $J_{mag}(p_z)$ for p_z > 2a.u.) have a shape characteristic of a 3d spin moment, and this represents the moment on the Co 3d-like electrons. In the region p_z < 2a.u., the profiles dip significantly, indicating the presence of a negatively polarised conduction electron moment, as is characteristic of the ferromagnetic 3d transition metals. For p_z < la.u., the MCPs are anisotropic, indicating the directional dependence of the itinerant moment. In order to analyse this in detail, we are performing KKR-CPA calculations of the electronic structure and spin density, in collaboration with J.B Staunton (Warwick) and J. Poulter (Bangkok). Previous calculations of the spin moment predict the existence of a Pd moment aligned parallel to the Co 3d moment. Cur analysis will reveal the extent of this and its directional behaviour.

In figure 2 the third direction in Pd_3Co is presented (open circles); the first two were measured last May (see experiment report HE-160). The second curve (triangles) is the PdCo [100] MCP of figure 1, shown again for comparison. The first point to note is that the total spin moment per formula unit is ~50% of that in PdCo. The actual values are not yet calculated, but it appears that the relationship between composition and moment is not straightforward. The main difference between these profiles is again at low momentum, where the distinct peak in PdCo near $p_z = 0$ is not reproduced in the Pd_3Co results. Again our band calculations will facilitate the interpretation of these data. We need to complete the analysis of HE-l 60 and HE-381 before we propose further studies of the spin density on this alloy system.