ESRF	**Experiment title:** Fast access beamtime	**Experiment number**: HC-5356
Beamline: ID32	**Date of experiment**: from: 23/09/2023 to: 25/09/2023	**Date of report**: 08/11/2023
Shifts: 6 (3+3)	**Local contact(s)**: Kurt Kummer	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report:

Fast access beamtime for 2 user groups at the ID32 XMCD end-station. Samples were shipped in by the users. 3 shifts of beamtime were given to each user group. Both user groups were first time users of ID32.

[A] XMCD study of the element-specific contributions to the magnetism in $Nd_3Fe_3Sb_7$
23/09/2023 8:00am - 24/09/2023 8:00am (3 shifts)

Users had an extensive dataset of magnetisation data taken in static magnetic fields up to several Tesla and pulsed magnetic fields up to 60 Tesla. The $Nd_3Fe_3Sb_7$ single crystals showed interesting magnetic properties but it was found that information on the element-specific contributions to the magnetic properties was needed in order to obtain a better microscopic understanding and be able to compare with calculations. In particular, the users were interested in whether the Sb sites show a small induced magnetic moment and how that moment relates to the Fe and Nd moments respectively. A first draft of a manuscript had already been prepared and the users ask if XMCD measurements could be performed in a timely manner to help with finalising the manuscript. 3 shifts of beamtime were considered sufficient for the following experimental plan: XMCD at the Sb $M_{4,5}$ edges and Fe $L_{2,3}$ edges at B = 9T for T = 10 K and T=100K. Fe and Sb XMCD field sweep between ±9 T for both temperatures. The samples were shipped in, prepared for top-post cleaving and measured by the beamline staff. The full experimental programme was realised in the allocated 3 shifts, including additional measurements at the Nd edge. The obtained XMCD at all 3 edges were of very good quality and allowed the users to obtain a full microscopic understanding of the magnetism in $Nd_3Fe_3Sb_7$ single crystals. The final data analysis and additional calculations are now underway and the manuscript will be finalised and submitted within the next months.

[B] Induced magnetism in Fe doped Cr_2GeC and magnetic properties of $NdSrCoIrO_6$ studied with XMCD
24/09/2023 8:00am - 25/09/2023 8:00am (3 shifts)

Users contacted the beamline staff about the possibility of XMCD measurements on Fe doped Cr_2GeC samples. They had already a full draft of a manuscript prepared in which they demonstrated ferromagnetism induced by Fe doping based on macroscopic magnetisation measurements. Their DFT calculations suggested a finite moment developing on the Cr sites. However, a previously published XMCD study on Mn doped Cr_2GeC found magnetic moments on the Mn sites only. Hence, in order to establish whether the observed ordered magnetic moment is located on the Fe sites, the Cr sites or whether both elements contribute, additional XMCD measurements were needed. A maximum of 3 shifts of beamtime were considered sufficient to perform these measurements. The shipped samples were prepared for post-cleaving and XMCD measurements were performed by the beamline staff. The additional XMCD measurements established that the Fe XMCD agrees well with the macroscopic magnetisation curves and that no (ordered) magnetic moment is present on the Cr sites. Less than 3 shifts were needed to obtain the Fe and Cr XMCD spectra and a full Fe magnetisation curve between ±9 T. Therefore, the remaining time was used to investigate $NdSrCoIrO_6$, a second system heavily studied by the same user group. Magnetic moments, both on the Nd and Co sites were found and followed as a function of applied field. The XMCD data will be included in a second manuscript already prepared by the users and helped to get a better microscopic understanding of the observed macroscopic magnetic properties.