ESRF	**Experiment title:** Influence of superconducting order parameter on ferromagnetism in YBCO/LCMO bilayers	**Experiment number:** HE1692
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Report:

The aim of this work was to probe the proximity effect between the High T_c superconducting and ferromagnetic correlation lengths in $La_{0.7}Ca_{0.3}MnO/YBa_2Cu_3O_{7-\delta}$ superlattices. $[(La_{0.7}Ca_{0.3}MnO)_{100\mathring{A}}/(YBa_2Cu_3O_{7-\delta})_{100\mathring{A}}]_{10}$ superlattices were grown using sputtering techniques at Salerno University. SQUID magnetometry revealed an interesting interplay between the superconducting and magnetic components of these systems. In particular a small magnetic perturbation was observed when zero-field cooling (ZFC) the system below the superconducting ordering temperaruture. This was not observed when cooling in a small applied field (FC). This implies an interesting interplay between the superconducting and ferromagnetic order.
Using XMCD it was hoped to directly probe the magnetic order of the LCMO blocks in these two phases to determine the effect of the superconducting order on the ferromagnetic blocks. It would be possible to determine the magnetic polarisation at the superlattice interfaces by measuring the XMCD signals from several grazing incidence superlattice Bragg peaks.
The sample was mounted in a variable temperature displex with a base temperature of 10 K. The incident x-ray polarisation was varied from right-handed circularly polarised to left-handed using the ID20 phase plate. A small magnetic field, T < 1 T was apllied in the plane of the sample. Under these conditions it was first attempted to probe the FC phase at base temperature. The incident x-ray energy was tuned to the Mn K edge, E = 6.539 keV, and reflectivity curves for right and left circularly polarised x-rays were measured.

Unfortunately there was no detectable variation in reflectivity signal as expected nor was an XMCD signal observed. This is possibly due to a combination of sample size and low scattering cross-sections at the Mn K-edge of LCMO. It is not possible to grow superlattice structures with a larger number of bilayer repeats since that would affect the crystallinity of the system. The thickness of each component can also not be altered since these lengths, 100 $\mathring{A}$, are comparable to the correlation lengths of the individual components and therefore allow the observation of any perturbations. K-edge resonant magnetic scattering from thin film manganite system appear to be beyond our capabilities at the moment.