ESRF	**Experiment title:** Local anisotropy at the Mn site in layered manganites studied by XANES and EXAFS spectrocopy.	**Experiment number**: HS2107
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Report:

A complete XANES and EXAFS study at the Mn K-edge of $La_{1-x}Sr_{1+x}MnO_4$ (x=0, 0.3, 0.45, 0.5 and 0.55) layered-manganites has been carried out across the so-called charge-ordering (CO) transition as a function of temperature in both, polycrystalline and single-crystals [001]-oriented sets of samples to analyse the structural effects related to (1) the presence or absence of distortion and (2) the kind of distortion of the MnO_6 octahedra.

In these manganese oxides with a single-sheet layered structure, MnO_2 sheets in the *ab* plane are isolated by two La(Sr)O planes in such a way that oxygens atoms are not shared along the *c*-axis. Then, the local z axis elongation of the distorted Mn sites is along the *c*-axis while in $RE_{1-x}A_xMnO_3$ perovskites, the local z axis elongations form an ordered structure within the *ab* plane. The CO transition is observed in $La_{1-x}Sr_{1+x}MnO_4$ (x~0.5) at T_{CO}~230 K and it has been proposed to be dependent on the magnitude of the lattice distortion.

In the polarization XANES and EXAFS experiment we have performed, we have analysed the evolution with doping ratio x and temperature of the in-plane (E $||$ *ab* plane) and out-of-plane (E $||$ *c* axis) Mn-O bond lengths, separately. Polarized absorption spectra were recorded in Total electron yield (TEY) mode at BM29 using a Si(111) monochromator with an energy resolution of about $8x10^{-5}$.

In Figure 1, we compare the Mn K-edge XANES spectra for the undoped $LaSrMnO_4$ (a) and the half-doped $La_{0.5}Sr_{1.5}MnO_4$ (b) compounds at RT for both polarizations.

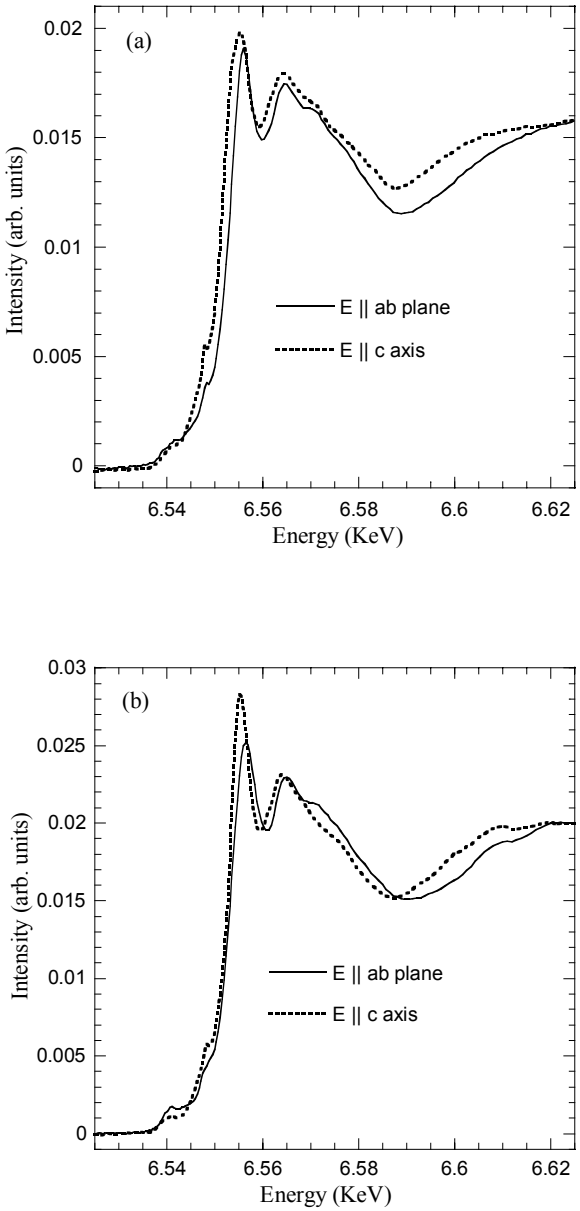

Fig.1 In-plane ($E \parallel ab$, solid line) and out-of-plane ($E \parallel c$, dotted line) absorption spectra at the Mn K-edge of (a) $LaSrMnO_4$ and (b) $La_{0.5}Sr_{1.5}MnO_4$ samples. The $E \parallel c$ configuration corresponds to an angle of around 70 deg to the *ab* plane.

A chemical shift of about 1.7 eV is clearly found for the undoped compound, formally a Jahn-Teller distorted Mn^{3+}, showing a strong anisotropy of the Mn local environment. This result agrees with the typical anisotropic shift found in related systems as $LaMnO_3$ with a similar Jahn-Teller distorted trivalent Mn site. The distortion is reduced along the series up to $La_{0.5}Sr_{1.5}MnO_4$ where the chemical shift between the spectra for the two polarizations is almost zero. However, anisotropy of the local structure around the Mn atom is still worth noted by changes in the intensity ratio of the different features of the absorption edge between the two polarizations.

A detailed analysis of the local structure and its evolution with temperature across the CO transition is still in progress in order to determine the nature of this transition.