ESRF	**Experiment title:** The interplay between inelastic charge-density-wave correlations and magnetic fluctuations studied by polarimetric RIXS in electron-doped cuprates	**Experiment number**: HC 3291
Beamline: ID32	**Date of experiment**: from: 13 September 2017 to: 19 September 2017	**Date of report**: Feb 26, 2020
Shifts: 18	**Local contact(s)**: Flora Yakhou-harris (email: yakhou@esrf.fr)	*Received at ESRF:*

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Report: This work, combined with the work from HC 2386, resulted in the following publicaton:

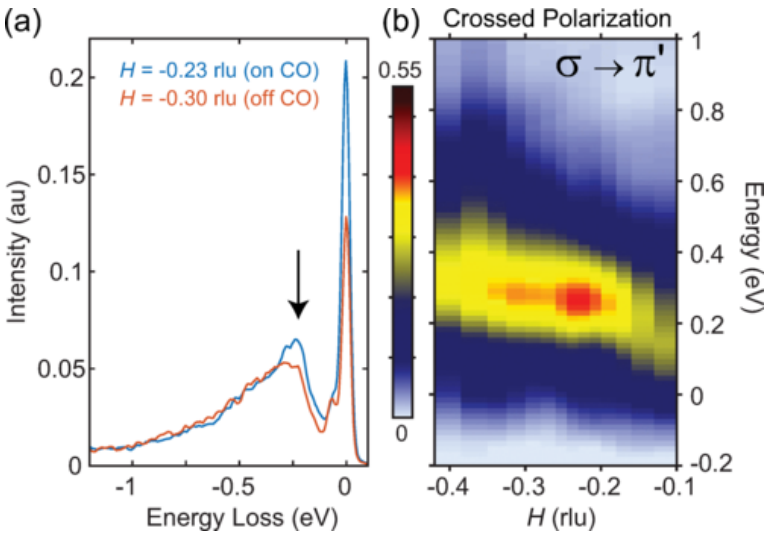
E. H. da Silva Neto, M. Minola, B. Yu, W. Tabis, M. Bluschke, D. Unruh, H. Suzuki, Y. Li, G. Yu, D. Betto, K. Kummer, F. Yakhou, N. B. Brookes, M. Le Tacon, M. Greven, B. Keimer, and A. Damascelli
Phys. Rev. B 98, 161114(R) – Published 17 October 2018

A similar version is available in the arXiv: https://arxiv.org/abs/1804.09185

The abstract of the paper reads: Charge order has now been observed in several cuprate high-temperature superconductors. We report a resonant inelastic x-ray scattering experiment on the electron-doped cuprate $Nd_{2-x}Ce_xCuO_4$ that demonstrates the existence of dynamic correlations at the charge-order wave vector. Upon cooling we observe a softening in the electronic response, which has been predicted to occur for a d-wave charge order in electron-doped cuprates. At low temperatures, the energy range of these excitations coincides with that of the dispersive magnetic modes known as paramagnons. Furthermore, measurements where the polarization of the scattered photon is resolved indicate that the dynamic response at the charge-order wave vector primarily involves spin-flip excitations. Overall, our findings indicate a coupling between dynamic magnetic and charge-order correlations in the cuprates.

Although the results are fully described in the published paper above, below you can see a short summary of the acoomplishments,

First, the beamtime was highly successful, we had no beam losses and no instrumentation failures and the few small glitches regarding the complex data acquisition of polarimetric data did not compromise our objectives – the beamline scientists were very quick in indentifying and fixing those problems. It should also be noted that this was a complicated beamtime, where we focus on the systematic use of the polarimeter to decompose the cross-polarized and non-cross-polarized signals. We had two primary goals:



Goal #1, measure the spectrum on and off the charge order wavector to identify the energy scale of the dynamic charge order correlations with the best available Cu-L_3 RIXS resolution (35 meV). Figure (a) shows the result where we clearly identify the relevant energy scale.

Goal #2, Measure the sigma-sigma and sigma-pi scattering channels to decompose spin-flip and non-spin-flip contributions. The use of the polarimeter is extremelly challenging, especially because we focused on a very small signal on top of the much stronger paramagnon escitations. Nevertheless we are proud to report an extremelly well-resolved measurement, where we found that the detected charge order fluctuations were present in the sigma-pi bu not the sigma-sigma channel Figure (b). This evolved into our primary finding of a "Coupling between dynamic magnetic and charge-order correlations in the cuprate superconductor NCCO", which is the title of our paper. We can thus confirm that the polarimeter works well and that its use has become enough user-friendly to allow for systematic experiments carried out also from less expert users.

Also see the figures below for additional data from the beamtime (also publsihed in the Supplementary Material of the paper).