March 2012 ALBA newsletter

Accelerators

http://www.cells.es/Divisions/Accelerators

- The last week-end of February was dedicated to machine studies. Two major improvements have been done: 1) adding the RF frequency in the SOFB in order to compensate for machine movements and drifts and 2) changing to a working point such that small tune shifts do not influence the beam lifetime.
- Both improvements have resulted on a more stable beam for the beamlines commissioning (Fig. 1).

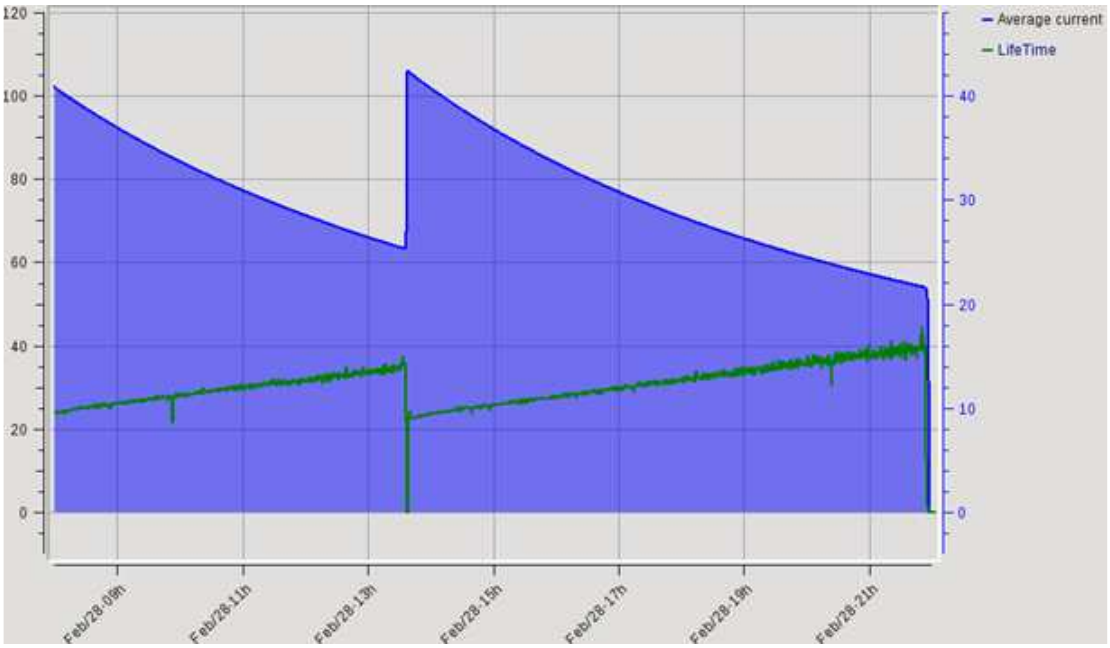

Figure 1. Accelerators: This figure shows a typical day with the 2 injections up to 100 mA for the beamlines.

Beamlines

http://www.cells.es/Beamlines

*** BL04-MSPD: Materials Science and Powder Diffraction.**

- The factory acceptance tests of the 3-circle powder diffractometer (3C-PD) has been performed at Huber premises in Rimsting, Germany at the end of February (see Fig. 1). The 3C-PD was delivered in March 14th and is currently being installed in the experimental hutch (EH).
- The Kirk-Patrick (KB) mirror system has been installed in the EH after full metrology tests.

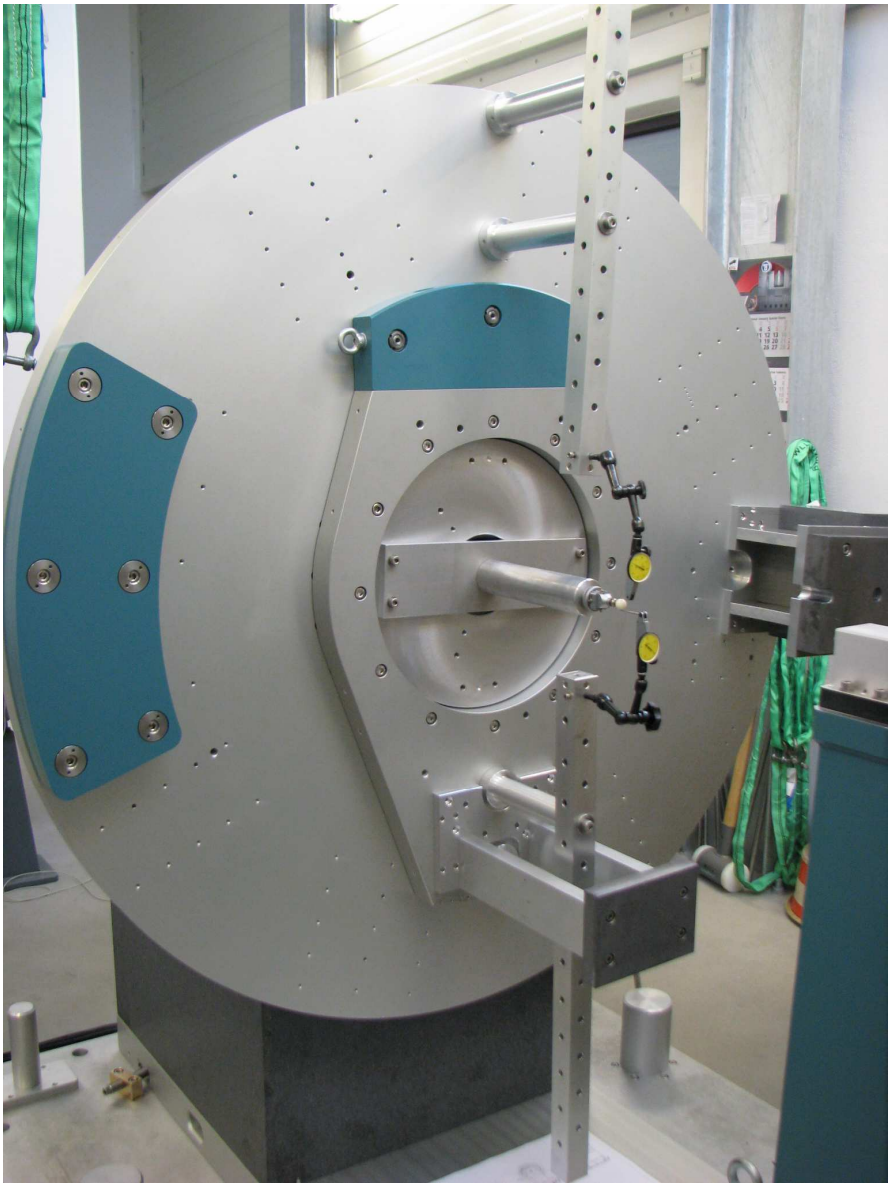

Figure 1. BL04-MSPD: The 3-circle powder diffractometer.

*** BL09-MISTRAL: X-Ray Microscopy.**

- A mechanical problem in the monochromator has occurred. We estimate that this problem will delay the commissioning of the microscope approximately one month.

*** BL11-NCD: Non-Crystalline Diffraction.**

- A Tango device server for the Time-Frame-Generator (TFG) of the data collection system has been written and tested. Also, the Python interface communicating with the device

server and with the TFG has been created and shown to work. This is a development that is essential for the exploitation of the station in due course.

- The focusing of the mirror systems of the line is currently being commissioned. So far, the focal spot is approximately 300 x 70 μm^2 FWHM (HxV) that is already good and will be reduced further in the coming weeks.
- Site Acceptance Tests (SAT) of the pixel prototype detector, S140 from imXPAD, have taken place and been successful on all accounts. The detector was placed in the photon beam and shown to perform very well. Local software interface written in Python that permits communication with the detector was written and tested by Alba staff. This part was shown to work and will now be integrated with LIMA that allows control of the detector system on the beam line via Tango where Tango is the control system at Alba.

*** BL13-XALOC: Macromolecular Crystallography.**

- We have managed to focus the x-ray beam at sample position to 60×12 μm^2 FWHM (HxV) and to unfocus it to 220×110 μm^2 FWHM with minimal effect of the corrected slope errors of the vertical focusing mirror. This allows the experimenter to adapt the size of the beam to the size of the sample (Fig. 1).

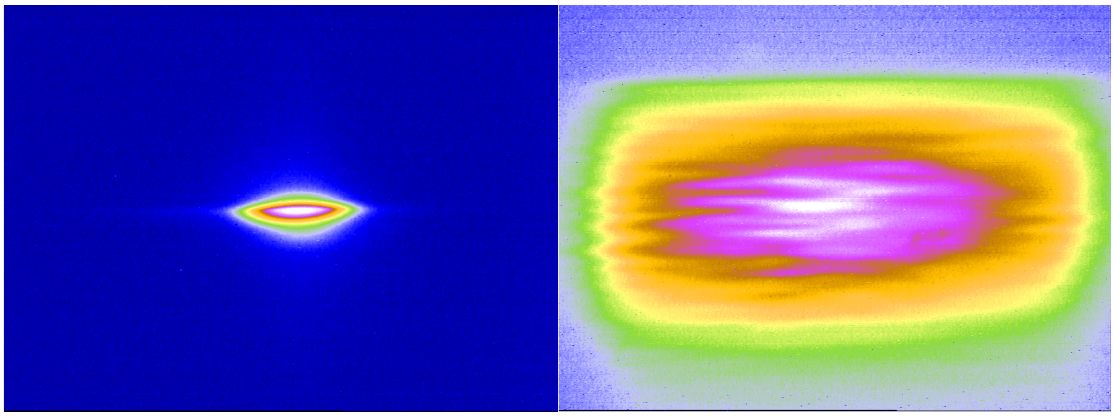

Figure 1. BL13-XALOC: (Left) Image of the focused beam ~ 60×12 μm^2 FWHM (HxV). **(Right)** Defocused beam ~ 220×110 μm^2 FWHM (HxV), showing small vertical inhomogeneities across the photon distribution. The beams are observed on a YAG at sample position and with the on-axis viewing system of the diffractometer.

- We are currently in the final design phase of the diode at sample translation system.
- We have advanced considerably in the control of the PILATUS 6M and its integration in the beamline's control system, in the control/movement of the omega axis which is currently undergoing metrology tests, and finally the control/beamline integration of the XFLASH fluorescence detector.

*** BL22-CLÆSS: Core Level Absorption & Emission Spectroscopies.**

- Several reparation/upgrade activities on the beamline monochromator, ionization chambers and electrometers have been taking place during the last month.

*** BL24-CIRCE: Photoemission Spectroscopy and Microscopy.**

- We have calibrated the energy offset and step of the plane grating monochromator (absolute angular offsets of mirror and grating) by measurements on reference samples (Fig. 1).

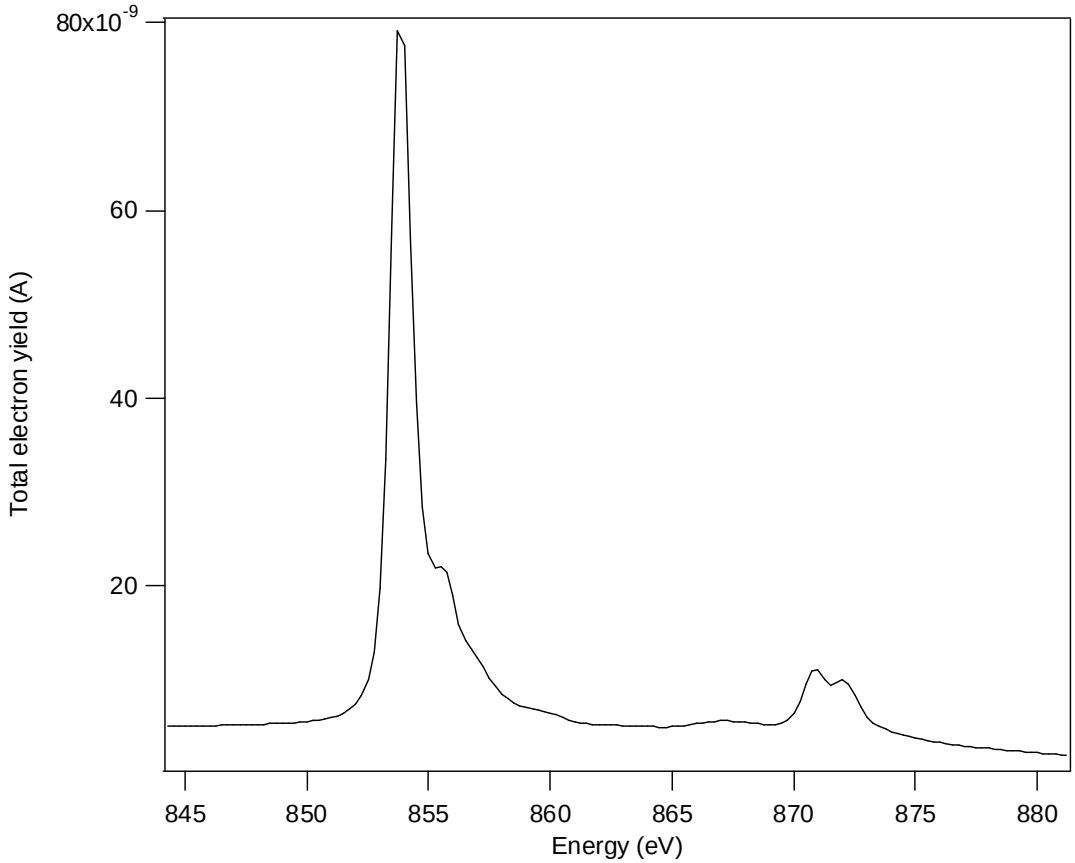

Figure 1. BL24-CIRCE: Ni L-edge absorption yield from a NiO sample with 900 l/mm grating, Cff = 2.2 and exit slit = 100 μm.

*** BL29-BOREAS: Resonant Absorption and Scattering.**

- The x-ray beam has been successfully aligned through the refocusing KB mirror duo and reaches now all the beamline optical components, and in particular a diagnostic with reference samples and the intensity reference diagnostic (Izero: mesh).
- Next step is to take the x-ray beam down into the XMCD end station: installation work, alignment procedures have been finished, and final UHV conditioning is undergoing. The

high-field vector (HECTOR) magnet endstation is already linked to the beamline (Fig. 1), for its immediate commissioning with beam (mid-March).

- The absolute photon flux at a calibrated diode at the intensity reference diagnostic (Izero:diode) has been estimated to be in the range of $5x10^{12}$ photons/s at various energies in the mid-range of the low energy grating (300 to 500 eV).
- XAS spectra, XMCD and XLD have been measured correspondingly in an Iron thin-film, graphite and nickel oxide reference samples by total electron yield with promising performances regarding energy resolution, intensity, or signal-to-noise ratio (Fig. 2). Such measurements, which have been done with the low energy grating –the only one available for now and with mid- and high-energy gratings expected to become operational after the summer-, actually demonstrate that the beamline optics performs well in the low photon-energy range. Also, this shows that an extended range up to about 1000 eV range can be covered in an acceptable manner by the low energy grating.

Figure 1. BL29-BOREAS: The end station of the high-field vector magnet (HECTOR) which has been aligned and connected at the beamline, and is about to be filled with liquid-helium for the first tests with x-ray beam in the next weeks.

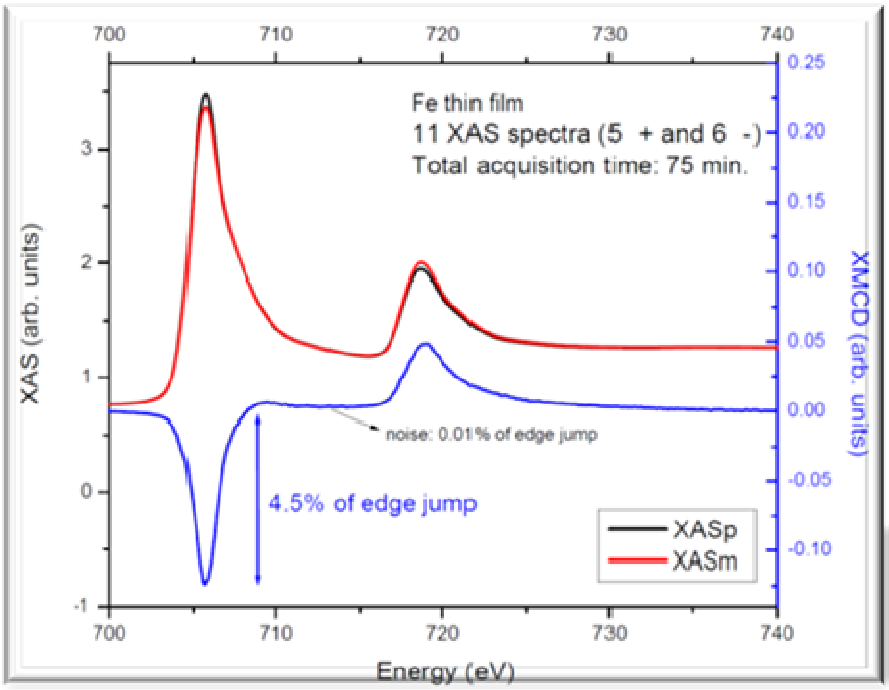

Figure 2. BL29-BOREAS: X-ray absorption spectra and magnetic circular dichroism measured by total electron yield in an Iron thin-film sample at photon energies covering the Fe $L_{2,3}$ absorption edges (measurements at a Reference-Sample Diagnostic, normalized to the drain current of the last KB mirror).