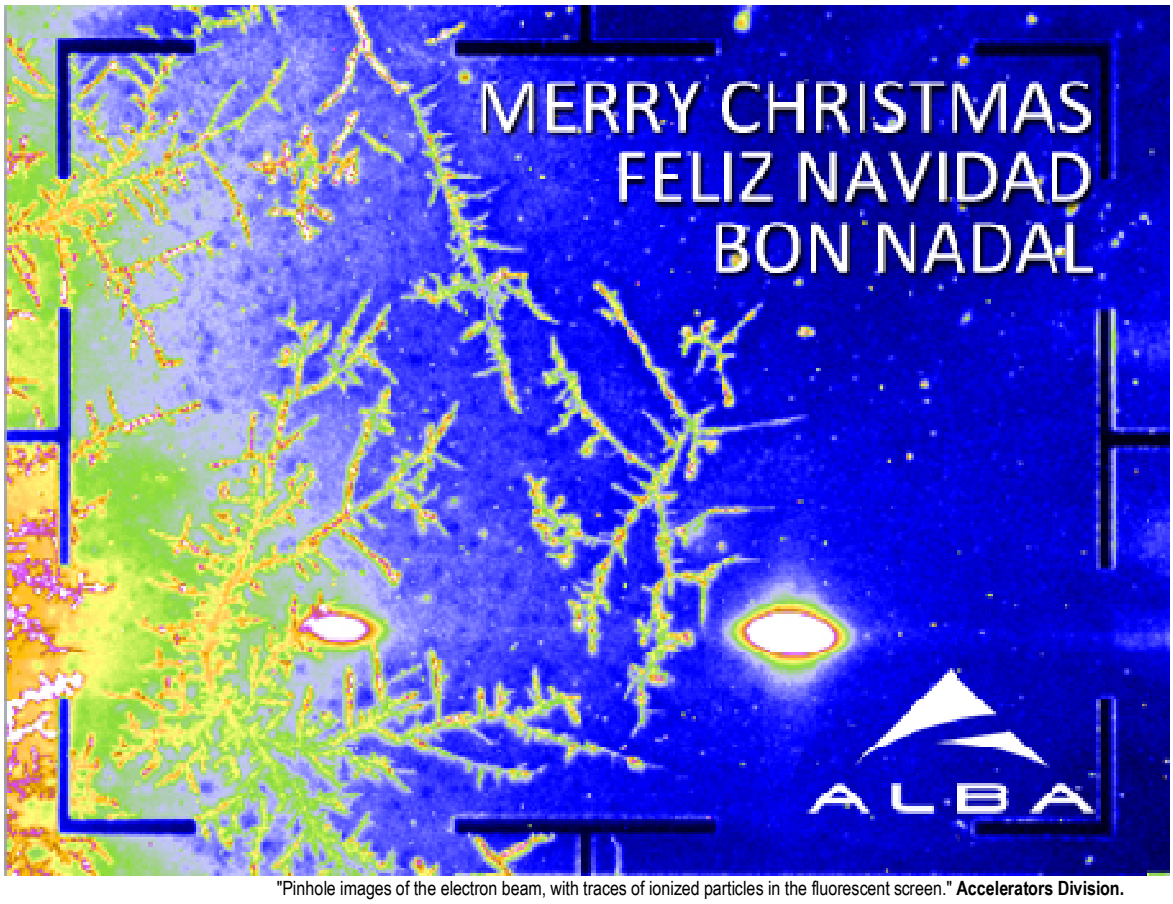
ALBA Newsletter
November 2012

The ALBA staff wishes you a Merry Christmas and a Happy New Year



"Pinhole images of the electron beam, with traces of ionized particles in the fluorescent screen." **Accelerators Division.**

New staff

http://www.cells.es/Jobs

We are pleased to announce the following new employees who have recently joined the ALBA synchrotron light source:

Núria Martí Soler.
Infrastructures engineer. Infrastructures Section.
Núria has a master on industrial engineering being specialized on civil engineering. She has previous experience in the design and construction follow-up of civil engineering projects.

José Prieto Burgos.
Workshop technician. Workshop and Labs group.
José has FPII qualifications on mechanics. He has previous experience on mechanical systems construction, assembly and commissioning.

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

- RUN_08 started on 14/10 and finished on 03/11 at 7:00 am, with 337 hours of beam planned for the beamlines. The availability of the machine has been around 95 % during this run. The problem with the superconducting wiggler (SCW) reported last month was identified as being due to a capacitor failure on the power supply. The problem has now been solved and the SCW runs again normally.

- Unfortunately at the beginning of RUN_09, on Tuesday 13/11, a major vacuum breakdown occurred due to several power supplies failing at the moment that the machine protection system was disabled. Pressure went up to 10^{-2} mbar in a few Storage Ring (SR) sections. Over the course of the following five days, vacuum technicians and colleagues from the mechanical workshop worked very hard to replace a number of damaged VAT seals flanges. On the 20th of November the SR was started again and one week later the beam was provided to the beamlines.

- Although initially RUN_09 had been cancelled for users, in view of the fast recovery of the SR, some of the beamlines opened for users at the beginning of December.

- The figure below (Figure 1) shows the evolution of the current x lifetime as a function of time since the incident. One can observe that by the end of RUN_09 the SR has reached again almost a product of 2000 which was the typical value before the incident.

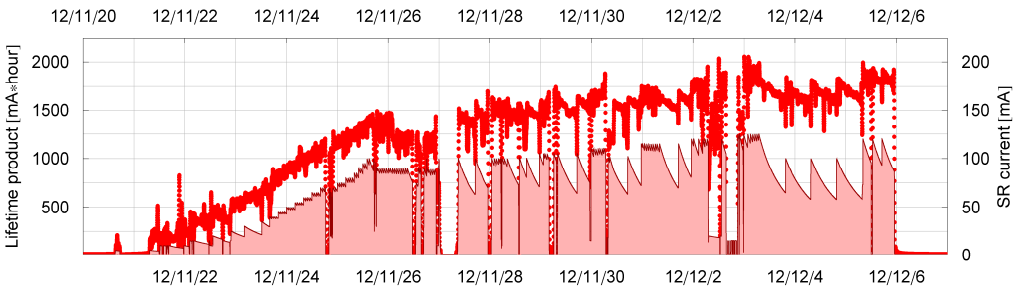

Figure 1. Accelerators: The evolution of the current x lifetime as a function of time.

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Experiments

http://www.cells.es/Divisions/Experiments
http://www.cells.es/Beamlines

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

- The final installation of the Mad26 electronics has been finalized.

- The commissioning with beam of the high resolution detector, Mad26, started during the first week of December. The first measured Si311 diffraction peak is seen bellow (Fig. 1). Note that the FWHM of the fit corresponds to 0.0076 degrees at 20 keV.

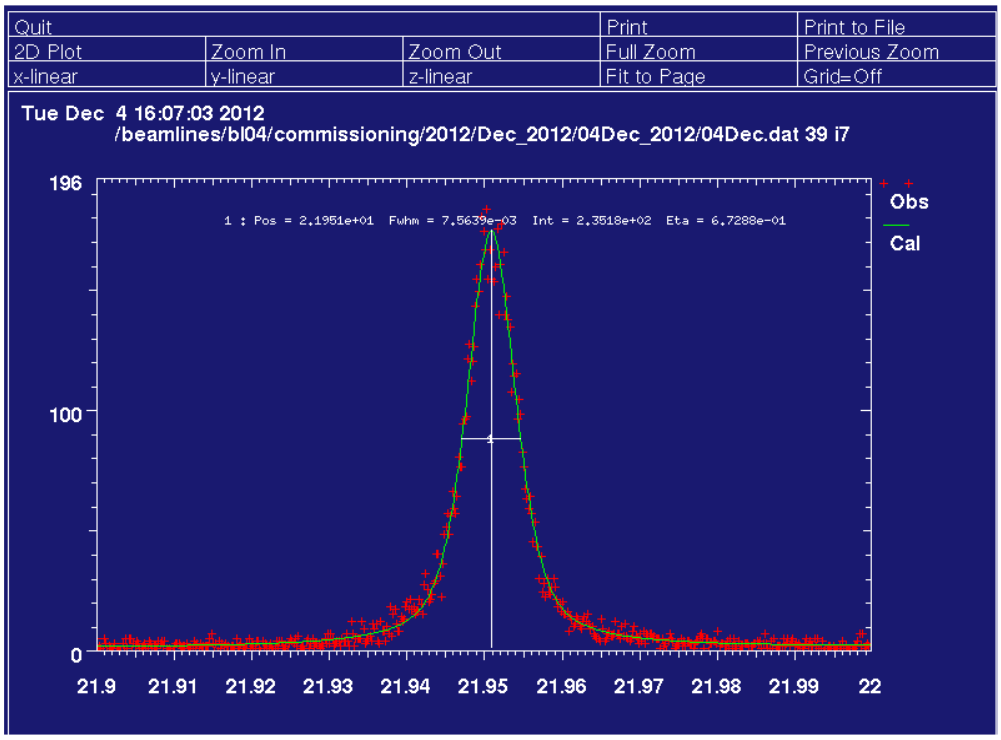

Figure 1. BL04-MSPD: The first measured Si 311 diffraction peak.

- The first Silicon powder diffraction pattern measured with the Mad26 at 20 keV is shown in Figure 2 and Figure 3 (~20 degrees in 2theta angle). Figure 2 shows the diagrams of two consecutive channels of Mad26. Figure 3 shows 12 of the 13 powder diffraction diagrams. The offset between consecutive channels is 1.5 degrees.

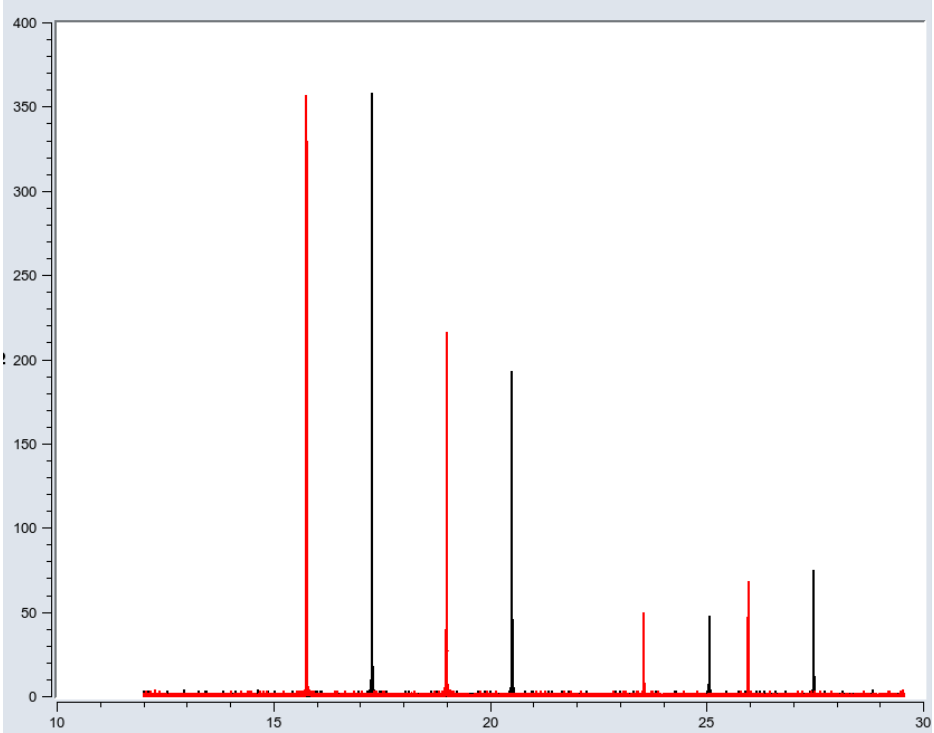

Figure 2. BL04-MSPD: The diagrams of two consecutive channels of Mad26.

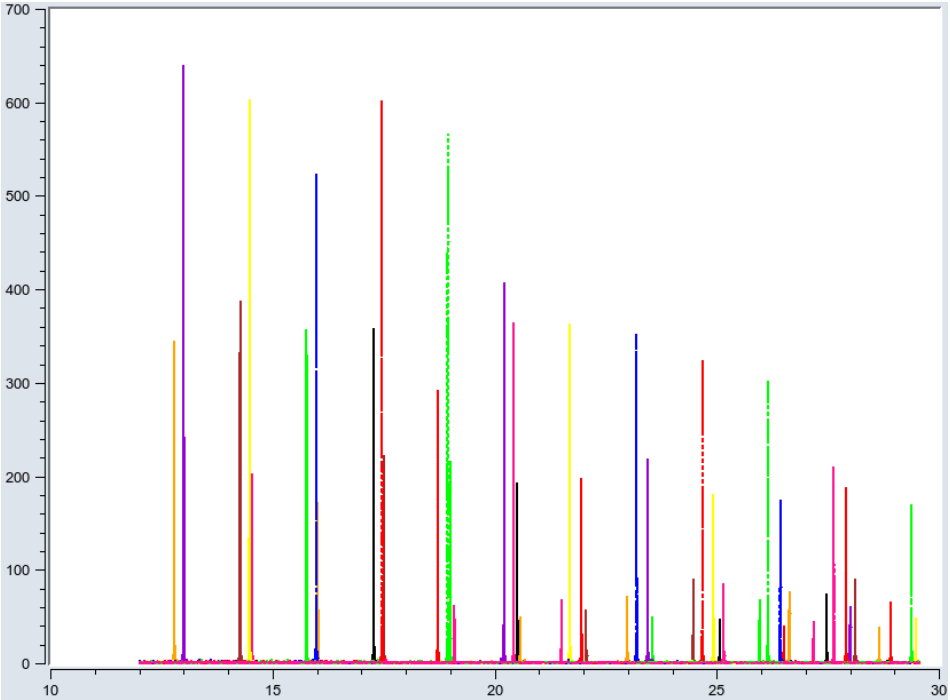

Figure 3. BL04-MSPD: 12 of the 13 powder diffraction diagrams. The offset between consecutive channels is 1.5 degrees.

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

- The commissioning of the X ray microscope at Mistral is advancing. It was determined that upgrades in the sample stage are required in order to achieve the expected performance in cryo-tomography. More precisely, it was found that the mechanical wobbling of the rotation axis was affected by the mechanical stress induced by the cooling system. Several solutions are underway to solve this issue.

- In the meantime magnetic domain imaging has been tested by using circular polarized light (from above or below the electron orbit plane) and the dichroic absorption effect on a Co/Pt 50 nm thick multilayer grown on a silicon nitride thin membrane. The sample was obtained by the group of prof. S. Mangin at Nancy University (France).

- The images in Figure 1 show the distribution of up and down magnetic domains acquired at the L3 absorption edge of Co at hv = 778 eV. The width of the domains is about 100 nm and they are perfectly resolved as it may be seen in the image on the right.

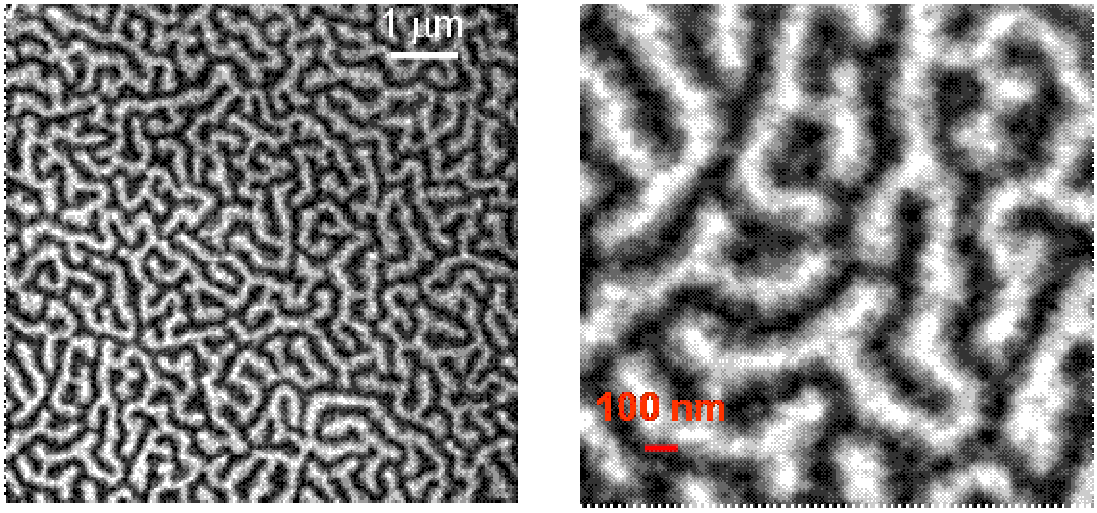

Figure 1. BL09-MISLTRAL: The distribution of up and down magnetic domains acquired at the L3 absorption edge of Co.

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

- Due to the serious vacuum problem that the Alba storage ring suffered in November we were forced to cancel all planned visits to the beamline for the rest of the year. We will contact all affected as soon as possible in 2013 in order to identify when these visits can be rescheduled. Note, that at the bottom right hand side on the Alba home page you can see the machine status:

  http://www.cells.es/static/Files/Computing/Controls/Reports/msGUI.html

- The photon beam profile along the optical axis of the beamline has been determined in order to characterize the performance of the line. The beam intensity was measured as slit blades in the vertical and horizontal of a slit system located just downstream the monochromator were moved. Preliminary results show that the FWHM of the monochromatic beam is ca. 5.03 x 1.16 mm^2 (HxV). These results are close to the theoretical values. This means that the in-vacuum undulator, IVU21, and the double crystal monochromator are performing according to specifications.

- The beam profile in the focal plane in the vertical is shown in the graph (Fig. 1). Here the beam has a FWHM of approximately 80 x 25 μm^2 (HxV) when the mirrors are left reflecting but not focusing. Again, these results are very good.

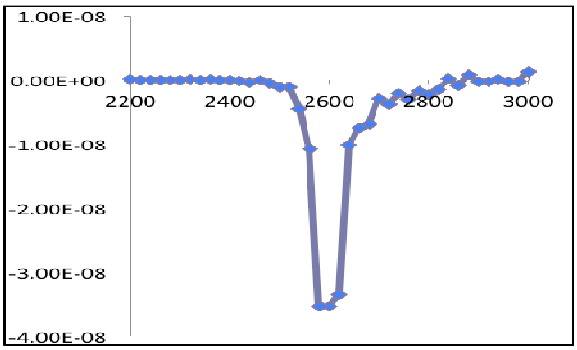

Figure 1. BL11-NCD: The differential photon beam intensity is shown as function of motor half-steps as one of the vertical slit blades in the guard slits is being moved through the beam. One half-step corresponds to a movement of 0.5 µm. Signal was recorded with an ion chamber.

- A number or tasks, maintenance, repair and installations will take place on the beamline as of to date and until third week of January 2013.

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

- The beamline had normal user operation until the unscheduled shutdown in November (see the Accelerators section for more information). Since the start of user operation this year 2012 we had a total 13 research groups from 11 institutions.

- The implementation of the characterization and strategy programs (EDNA) at our beamline control software has advanced.

- Some problems with the automated sample changer (robot) at our beamline that had to do with the positioning of the sample at the diffractometer have been resolved.

- An automated auto-focus system for the on-axis viewing system has been implemented.

- The control hutch has now an extra workstation for diffraction data analysis, processing, and crystal structure determination.

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

- The fluorescence detectors (Silicon Drift and CdTe from amptek.com) have been optimized in terms of communication reliability and have been tested at middle (K Cu) and high (K Ag) energies. The dead time and self-absorption corrections have been successfully demonstrated by comparison with transmission spectra.

- Moderately quick (continuous) energy scanning has been introduced and tested on copper reference spectra; see the beamline commissioning web page. This way of scanning has two advantages: (i) it removes a rather high per-point overhead in step scans and (ii) gives access to sample dynamics of minute time scale; in particular, it may be helpful for detecting and solving problems with x-ray induced reduction. The next generation of Alba electrometer (due in March) will enable essentially higher scanning speeds.

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

- On December 17th the installation of the upgraded photon beam entrance and the repair of the NAPP analyzer started.

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

- The Hector cryostat is operating again after a repair, which was needed due to a stacked sample holder (originated by some new transmission sample holders with a defective thread).

- Some flux measurements with the Medium and High Energy gratings have been completed, the grating focusing efficiency has been reviewed in collaboration with the Optics group (J. Nicolás) and the flux delivered at high energies has been explored using the so-called “wiggler mode” of our ID group (J. Campmany, A. Barla).

- Sample transfers have been tested satisfactorily with the modified transfer arms to allow manipulation of STM plates.

- With the assistance of the Scientific Magnetics staff, some circuitry has been optimized to decrease the induced noise on the electron yield signal when the feedback loop for sample temperature is on. The noise is still visible, but it has improved by a factor of more than 20 and it is about some 5 pico-Amps. We think there are still chances of some further improvement, and we will work on it.

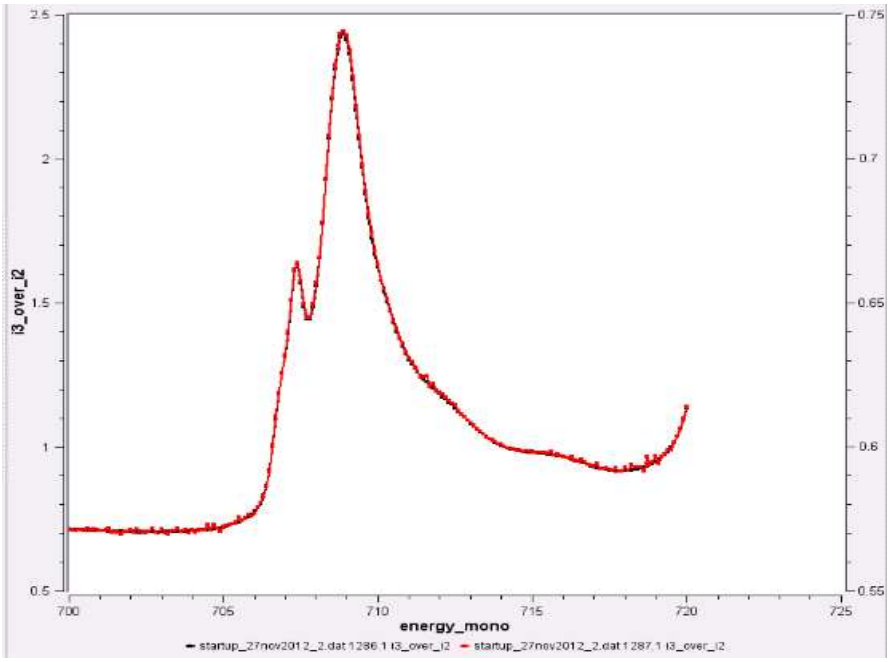

Figure 1. BL29-BOREAS: Comparison of two electron yield XAS measurements at the Fe L edge with (red line) and without (black line) the temperature stabilization feedback loop. The noise has been decreased by about a factor of 20, down to some 5 pico-Amps.

- We have also performed the cooling tests of the scattering end station cryomanipulator built by VG Scienta (based on IFW Dresden design), which achieved 12-13K at the cryostat and 16-17K at the sample in less than 30 minutes when starting from room temperature. This complies with the expected cooling performance and makes us confident that it will be a good system.