June 2012 ALBA newsletter

Accelerators

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

- RUN 5 started on 21/05 and finished on 16/06 at 7:00 am. There have been two daily injections to 100 mA.

- The availability of the machine has been better than 95 % during the first three weeks of the run with the main issues being a PSS interlock on a beamline which tripped the storage ring at 3:00 am, and a problem on the air compressors which required a complete restart of the system without beam.

- There have been 2 days dedicated to machine studies during this run. The main activities have been:

    - When injecting in top-up mode, the injector should perform with a high level of reliability and fulfilling specs on each injection. Along this line, the stability of the booster (BO) beam and the closure of the injection bump have been investigated.
    - The RF plants are tripping more often than expected. We have been investigating the mechanisms by which this happens and also applying several remedies in order to solve this problem.
    - Tests on the bunch-by-bunch transverse feedback system.

Beamlines

http://www.cells.es/Beamlines

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

- First powder diffraction experiments at BL04's high pressure end station. Figure 1 shows the diffraction diagrams of $CeScO_3$ obtained with incident energy = 29.2 keV and beam size ~ 50x50 μm^2. The experimental setup is shown in Figure 2.

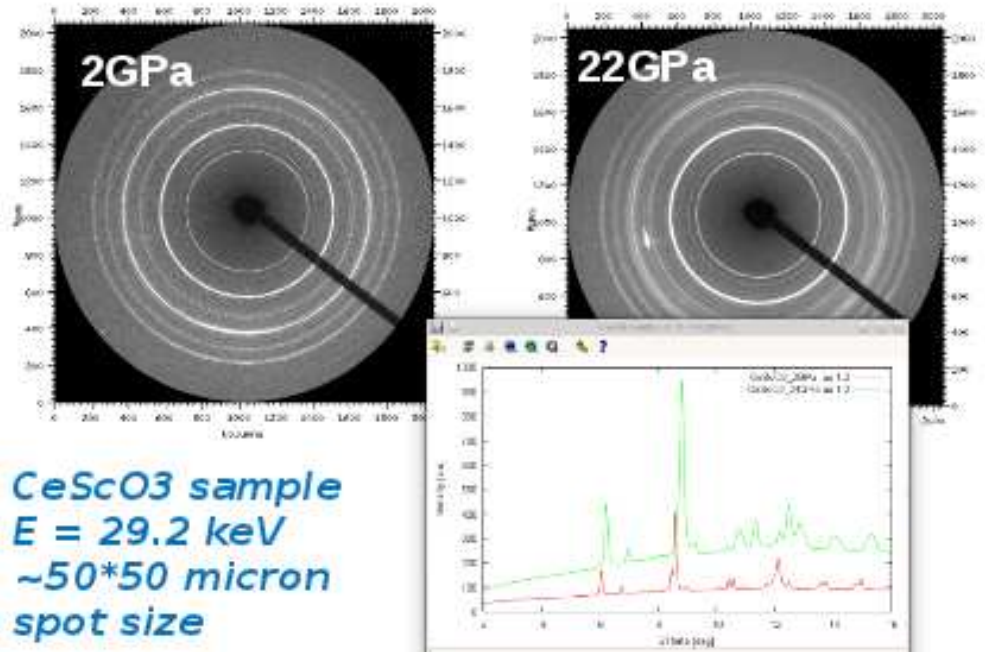

Figure 1. BL04-MSPD. 2D diffraction patterns taken with Rayonix SX-165 mm CCD camera at P= 2 GPa and P= 22 GPa, respectively, are shown, the powder diffraction diagram can be seen in the lower part.

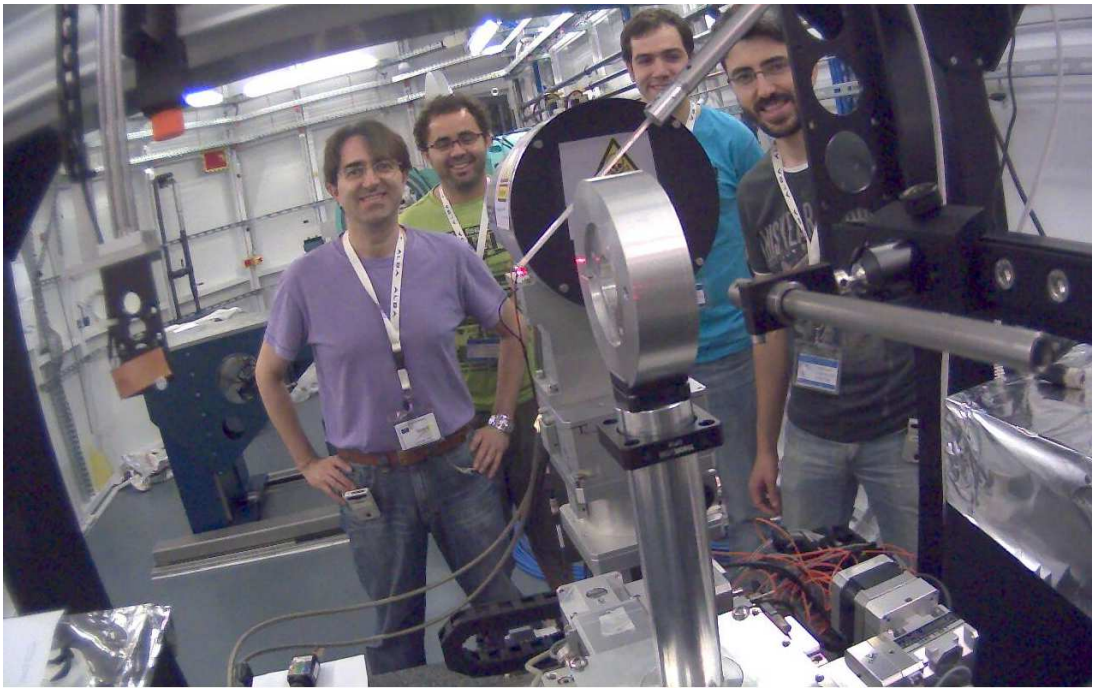

Figure 2. BL04-MSPD. First friendly users at BL04 high pressure end station. The diamond anvil cell, red laser spot at beam stop, collimator, and CCD camera are shown. The red laser is used for rough and fast alignment of collimator, sample, and beam stop.

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

- The BL optics have been focused to expected values (74 μm (H) x 12 μm (V)). The energy calibration of the monochromator has been achieved and the flux measured at 500 eV is $4*10^{10}$ ph/s with 100 mA of electron current in the storage ring.

- The Transmission X-ray Microscope has been pre-aligned by the alignment group. We have installed the capillary condenser which has been successfully aligned. In the next days, we will install the central stop and zone plate for further alignment.

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

- The mechanical assembly of the beamline has been completed.

- Data acquisition has been tested and shown to work well controlling fast shutter, triggering of detector etc.

- Benchmark experiments are being carried out.

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

- The fluorescence scan graphical user interface (GUI) and corresponding control macros are fully operational and have been tested with a variety of protein crystal samples containing Hg, Pt, Au, and Se (courtesy of Prof. D. Reverter, IBB, Barcelona) (Figure 1).

- On 8/6/2012 we phased our first SAD/MAD 360º-dataset from a Se-Met labeled DNA/protein complex (courtesy of Dr. G. Montoya, CNIO, Madrid) (Figure 1 and 2).

- We have a working version of the data collection widget to be implemented in the main beamline's GUI.

- We are finalizing the installation of the second XBPM on the diffractometer table.

- We have advanced in the integration, control, and performance of the sample changer robot (CATS).

- We are currently finalizing the electronic installation of the sample diode.

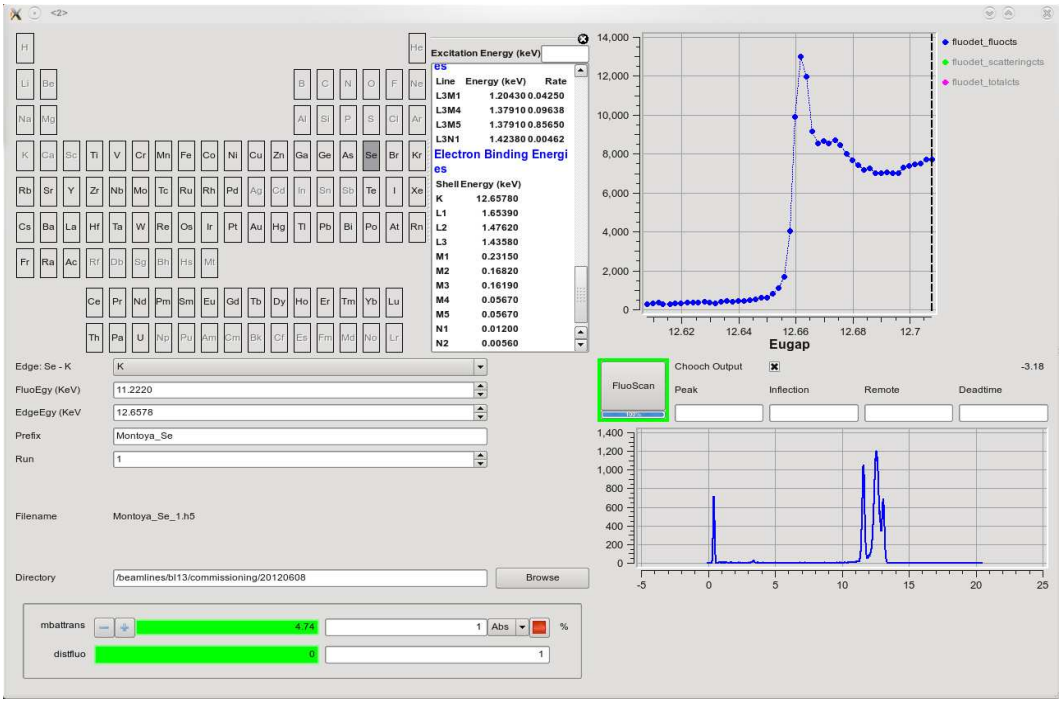

Figure 1. BL13-XALOC. A snapshot of the GUI used to obtain a fluorescence scan of a Se-Met labeled protein: the x-ray beam was at ~ 5 % transmission and 1 second exposure time/point.

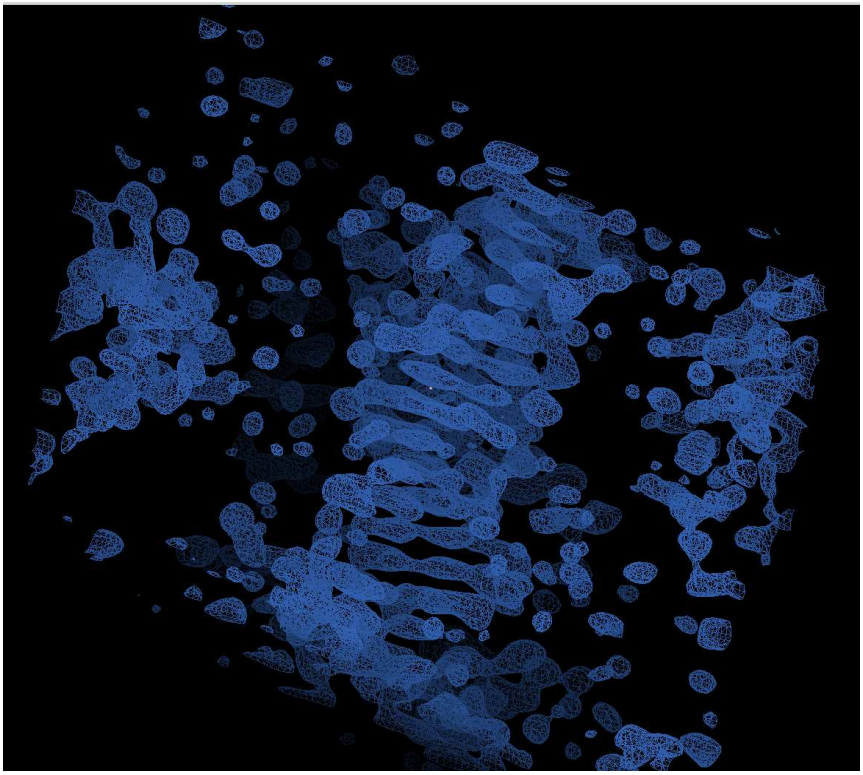

Figure 2. BL13-XALOC. First electron density (ED) map from a Se-Met SAD dataset collected at BL13-XALOC. The picture corresponds to an ED map at 2.4 Å (contoured at 1 σ) of a protein/DNA complex crystal, the data were processed using XDS, scaled with SCALA, and phased with SHELX.

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

- The ALBA-CLÆSS beamline announces a course on XAFS spectroscopy. The course will be held from Sept. 13th (noon) to Sept. 15th (noon) at ALBA and will start right after the course organized by the BOREAS beamline. You are welcome to join both courses.

  Please visit the beamline web page for further information:
  http://www.cells.es/Beamlines/CLAESS/

- The controller of our two conventional fluorescence detectors (Silicon drift and CdTe) has been incorporated into the beamline control system.

- The high precision positioning sample stage is now ready to use.

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

- On 6/6/2012 we let the beam through the KB refocusing mirrors for the first time, and on 8/6/2012 we obtained our first XPEEM image (Figure 1).

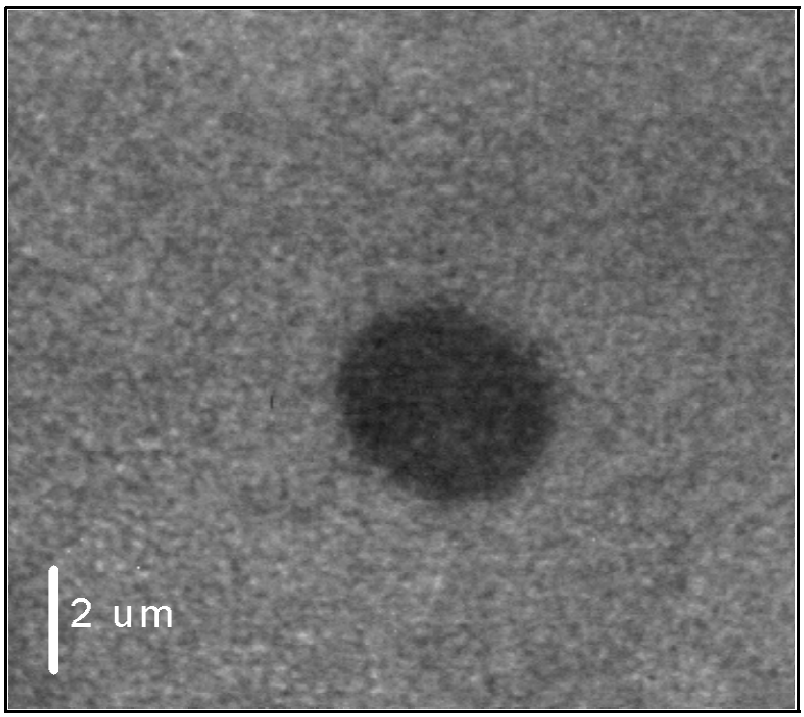

Figure 1. BL24-CIRCE. The sample corresponds to a graphene/SiC (topographic defect), $E_{photons}$ = 508 eV, $E_{electrons}$ = 0.5 eV.

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

- In the last month, a milestone for the beamline was achieved: the first two user experiments were carried out, with - we believe - satisfactory data quality on studies of various magnetic nanoparticle samples. One could emphasize two relevant points:

- Useful user feedback: from our users, we took note of problems and suggestions on apparent issues on the graphic user interface and command interface control (crashes, frozen applications, instabilities, errors...), macro reliability problems, but as well on other day-life aspects such as an effective on-site access control, water fountains in the experimental hall, car parking access…

- Effective efforts to enhance BL performance: regarding BL control issues, during the last month and a half, thanks to the efforts of the control group and BL control engineer, these have been reduced to a minimum: stable macro overnight measurements, no crashes on synchronous step-motion undulator plus monochromator energy scans, implementation of magnetic hysteresis loops from ALBA control system, etc. Not all detected or known issues can be solved in a short term basis: one of the experiments had to deal with a known issue of the high-field magnet end station, induced noise by the heater on feedback mode which limits the use of temperature stabilization during measurements, but our aims and expectations are that further commissioning of the end station and future work should allow us to enhance such performance.

- During this month, some relevant things that have been happening at BOREAS are:

- The site acceptance tests of a very special high temperature superconducting (HTS) magnet for the scattering end station. This magnet has been manufactured by a New Zealand company, HTS-110, and designed by the company in collaboration, and according to technical specifications and a preliminary viability study performed by the ICMAB institute and ALBA. The completed factory tests and part of the acceptance tests already performed indicate that the magnet should be expected to perform as desired (Fig. 1).

- A third official user proposal team will visit ALBA to perform their experiment at BOREAS after the short June shutdown.

- Last but not least, we are glad to announce that we are organizing a workshop on the fundamental aspects of x-ray spectroscopy, including lectures and tutorials on the use of CTM4XAS and CTM4RIXS. The lectures and tutorials will be given by Prof. Frank de Groot on September 12th-13th, 2012. Dates have been coordinated to those of another interesting workshop organized by the CLAESS beamline on EXAFS, so participants will have the opportunity to extend their visit at ALBA in order to participate in both courses. Further details will be provided soon in the ALBA events website (Fig. 2).

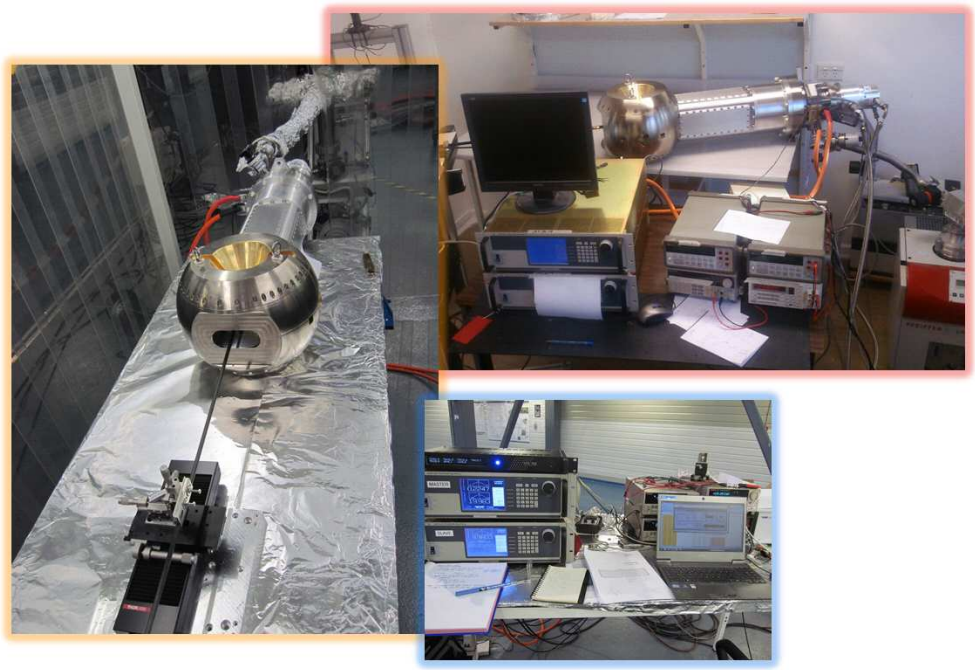

Figure 1. BL29-BOREAS. Several photos showing the HTS magnet for the scattering end station in test benches at ALBA as well as the factory in New Zealand. The magnet is designed to be UHV compatible and light enough to be inserted inside the vacuum chamber and carried by a rotary platform. It will allow fields up to 2 Tesla at large angles in scattering and specially in specular reflectivity geometries, with no liquid Helium consumption as it is cryo-cooler based.

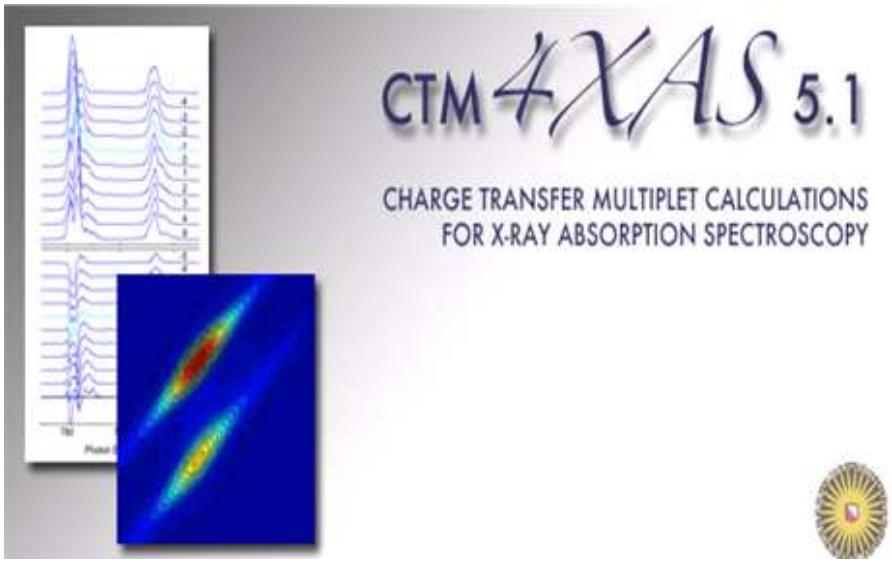

Figure 2. BL29-BOREAS. Announcement of the workshop for simulations of soft x-ray spectroscopic absorption and magnetic dichroism measurements.