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Accelerators

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

- Since mid October the operation schedule for the storage ring has changed. The morning shift is dedicated to additional commissioning of the storage ring and in the afternoons the electron beam is used by the beamlines to do their commissioning.

- During the first two weeks of beam for the beamlines the current has been limited to 25 mA, to ensure safe vacuum levels at the BLs and the orbit is kept within +/- 1-2 microns for one shift with the slow orbit feedback running with a 3 seconds repetition rate. Day to day we are observing shifts of up to +/-5 microns, which are now the subject of further investigations so that they can be minimized. Figure 1 shows a snapshot of the machine status GUI showing all front ends open and with gaps operating insertion devices.

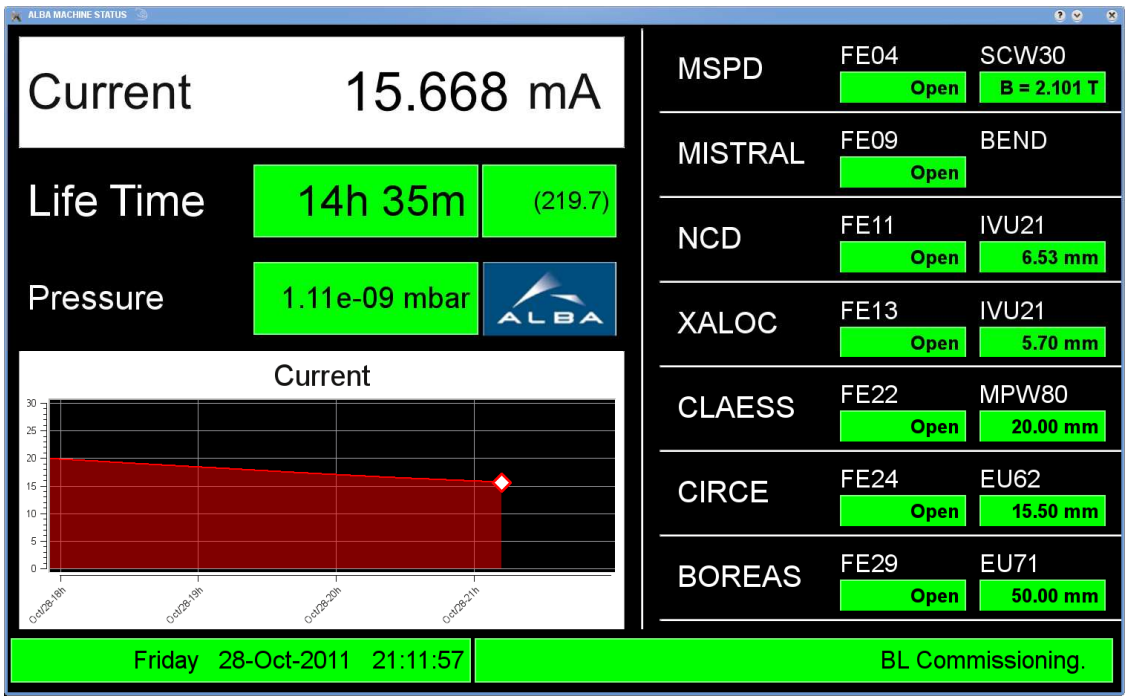

Figure 1. Accelerators: A snapshot of the machine status GUI during BL commissioning.

Figure 2 shows the beam position, read on a machine's BPM, for the duration of one of the shifts dedicated to BLs together with the electron beam current. Notice that, for this specific shift, the beam position does not change more than 1 micron with the slow orbit feedback running.

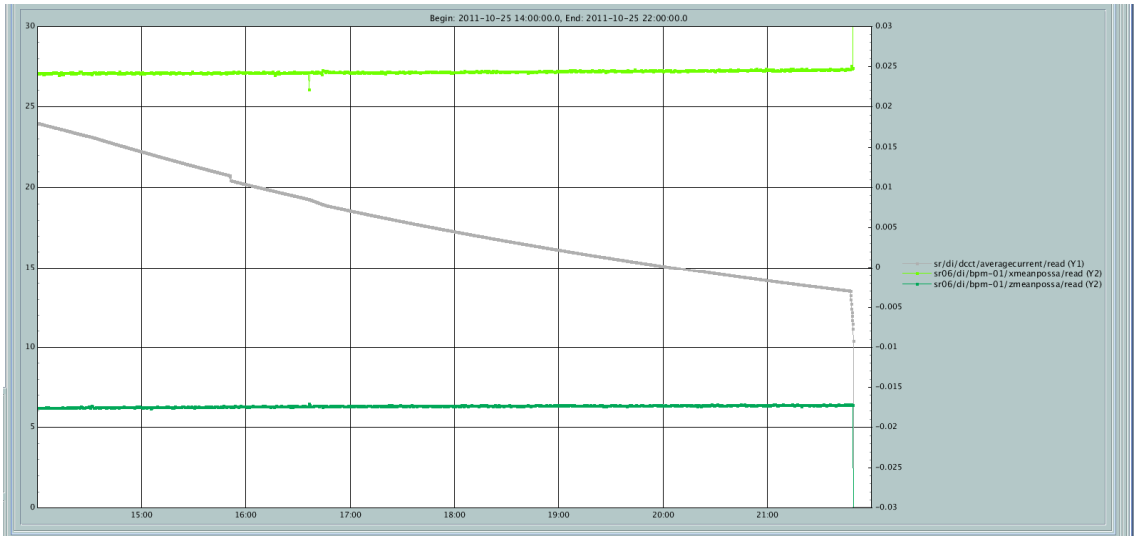

Figure 2. Accelerators: The grey line is the current along the shift, the light green one corresponds to the horizontal position of BPM_S06_01 and the dark green one is the vertical position of BPM_S06_01.

IDs

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

- The commissioning of the superconducting wiggler ended on Tuesday October 11th. The device is performing according to specifications, a maximum field of 2.1 T can be reached with current in the storage ring. No big influence on beam dynamics is observed and even injection can take place at any field, including maximum.

- With this, the installation and commissioning of the IDs for the 1st phase of beamlines is finished. From October 13th, they have been operating regularly and they are delivering light to all beamlines.

Beamlines

http://www.cells.es/Beamlines

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

- The beamline optics saw the ***first superconducting wiggler beam on October 11*** (see Fig. 1). The first opening of BL04 front-end that was part of the site acceptance test of the superconducting wiggler.

- The commissioning with x-ray beam started on October 28, 2011.

- We got mirrored beam at the fluorescence screen monitor of the optics hutch on October 28 2011 (see Fig. 2).

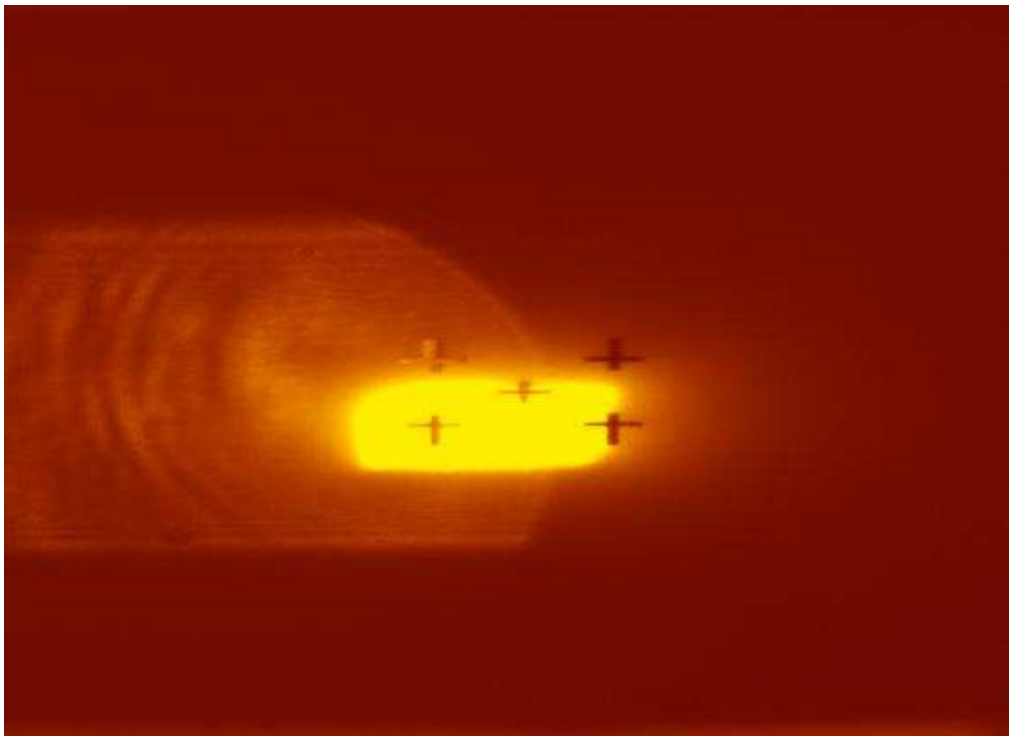

Figure 1. BL04-MSPD: Image of the beam with B=1 Tesla, ring current = 3 mA, the distance between the crosses corresponds to 3 mm in the vertical and to 2 mm in the horizontal axis respectively.

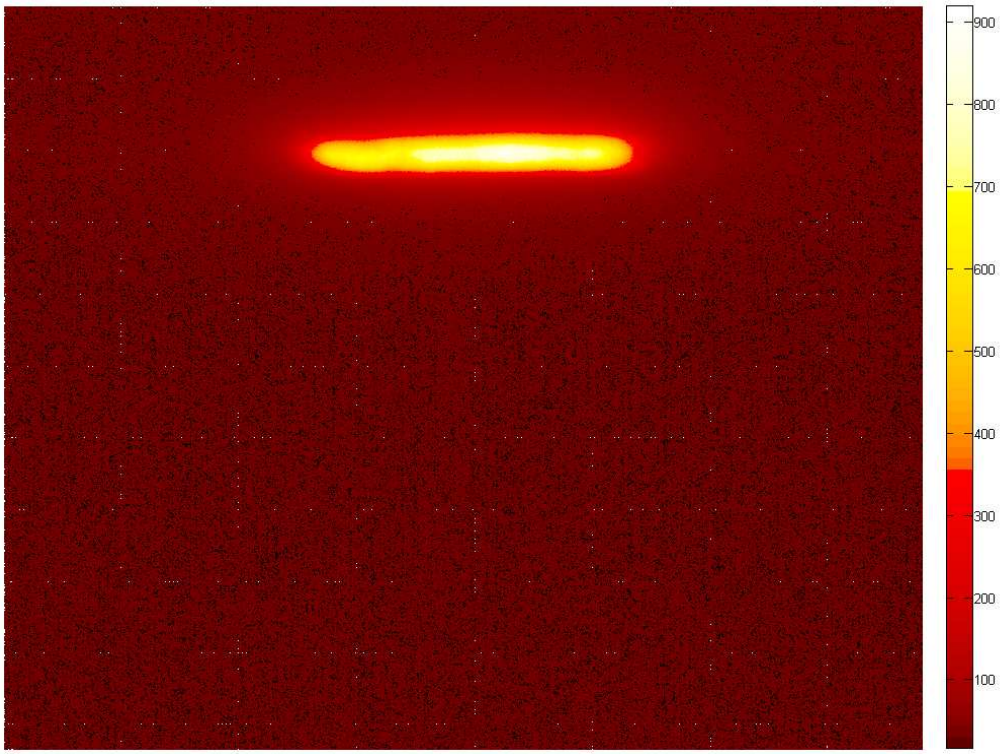

Figure 2. BL04-MSPD: Image of the reflected beam ("mirrored beam", non monochromatic) by the collimating mirror with B = 2.1 Tesla, storage ring current = 20 mA.

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

- We can observe the zero and first order x-ray beams at a photodiode installed at the entrance of the microscope.

- The first mirror has been focused on to the entrance slits and we are focusing the monochromator and the last mirror on to the exit slits.

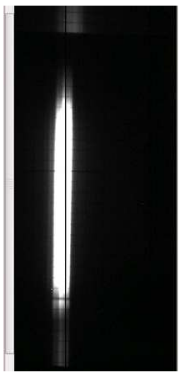

Figure 1. BL09-MISTRAL: First order x-ray beam on the last fluorescence screen before the exit slits.

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

- With the in-vacuum undulator tuned to the 5th harmonic and operating at ca. 6.4 mm gap the corresponding Bragg peak corresponding to ca. 9.6 keV was transmitted by the double crystal monochromator, DCM. The monochromatic beam was imaged on the first diagnostic element located downstream the DCM and is shown in the graph below.

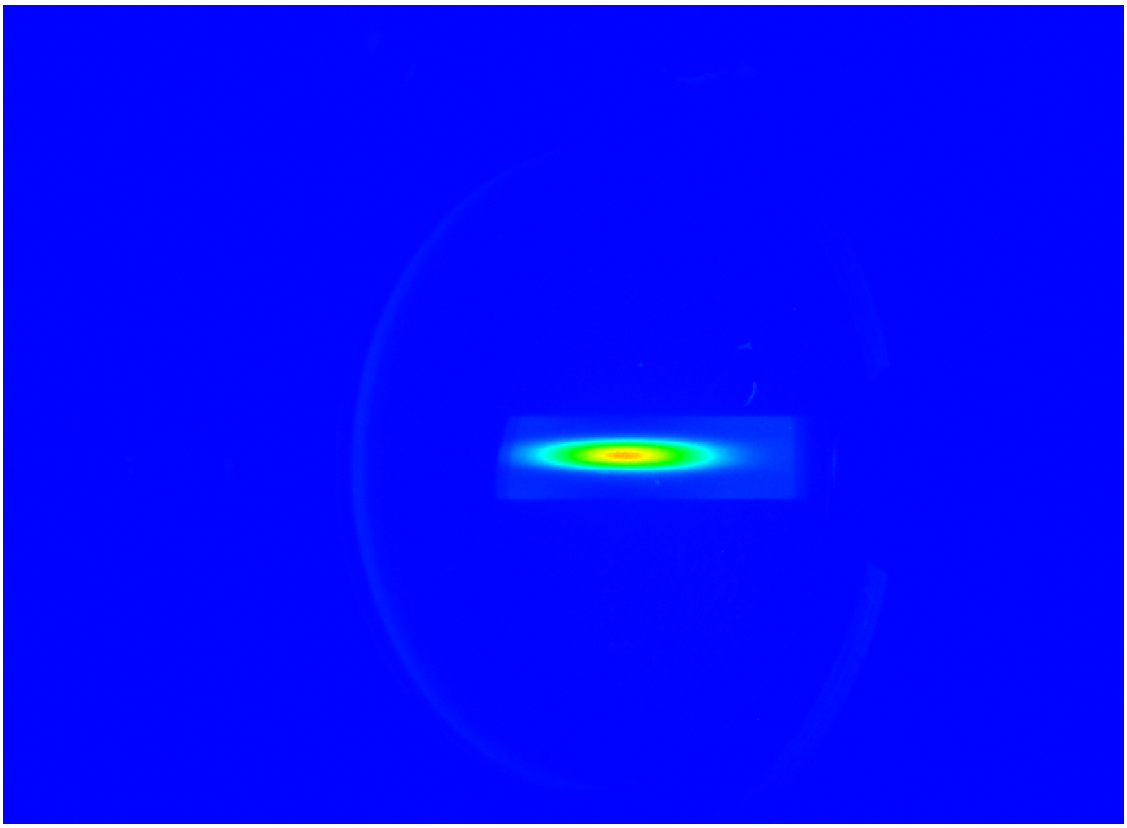

Figure 1. BL11-NCD: The monochromatic beam as seen on the first diagnostic element located downstream the DCM.

- The rocking curve width of the Bragg peak has been estimated and is less than 30 μm at this photon energy which is close to the theoretically expected value. From the foot-print of the beam recorded on the fluorescent screen monitor it has also been determined that the divergences in both the vertical and horizontal directions of the in-vacuum undulator are close to those specified, i.e. ca. 11 μrad and ca. 50 μrad in the horizontal and vertical directions respectively.

- Finally, the results also demonstrate that vibrations induced by the cryogenic cooling circuit and associated water cooling loop of the Si(111) crystal assembly to date are negligible.

- From the point of view of potential performance of BL11 these are very promising news.

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

- The commissioning of BL13-XALOC with x-rays started on October 18th. On this date we were able to see the white x-ray beam produced by the undulator on the *first* fluorescence screen right before the monochromator (see Fig. 1) and on the crystal of the monochromator (see Fig. 2).

- On October 25th we measured the 5th harmonic of the undulator with an x-ray position monitor situated right after the monochromator (see Fig. 3).

- On November 11th, we observed for the first time a monochromatic beam on the *second* fluorescence screen of the optics hutch of XALOC. This fluorescence screen sits right before the photon safety shutter and the experimental station (See Fig. 4).

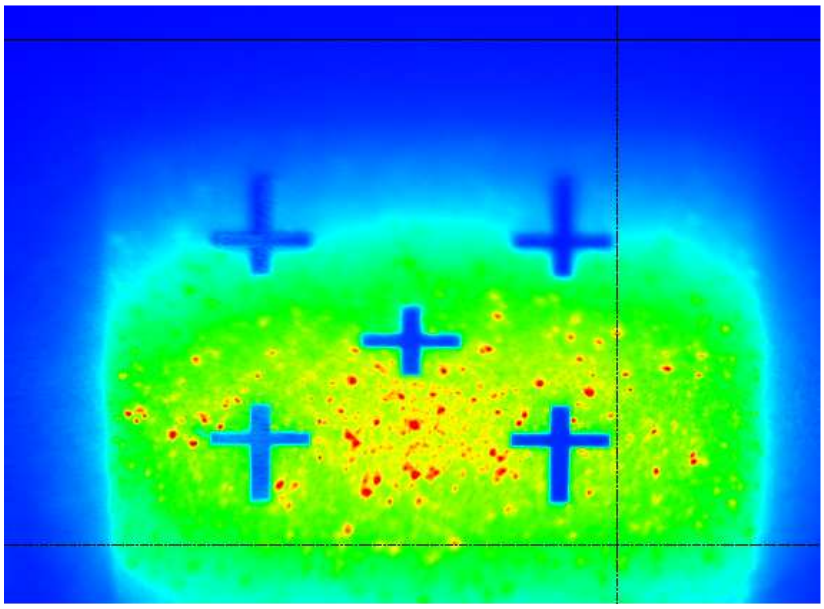

Figure 1. BL13-XALOC: View of the white beam at the first fluorescence screen in the optics hutch of XALOC. Inhomogeneities are due to the granularity of the chemical vapor deposition (CVD) diamond screen, and are not related to the quality of the beam. The undulator gap was at 5.7 mm, storage ring current ~ 15 mA.

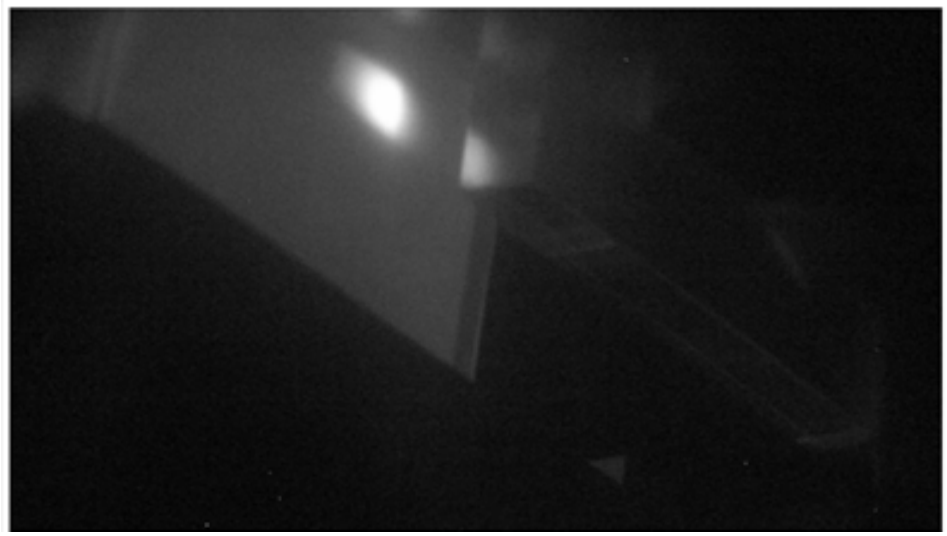

Figure 2. BL13-XALOC: This is a picture of the white beam hitting the channel cut monochromator. This photo was taken from one of the viewports of the monochromator using a high resolution CCD camera.

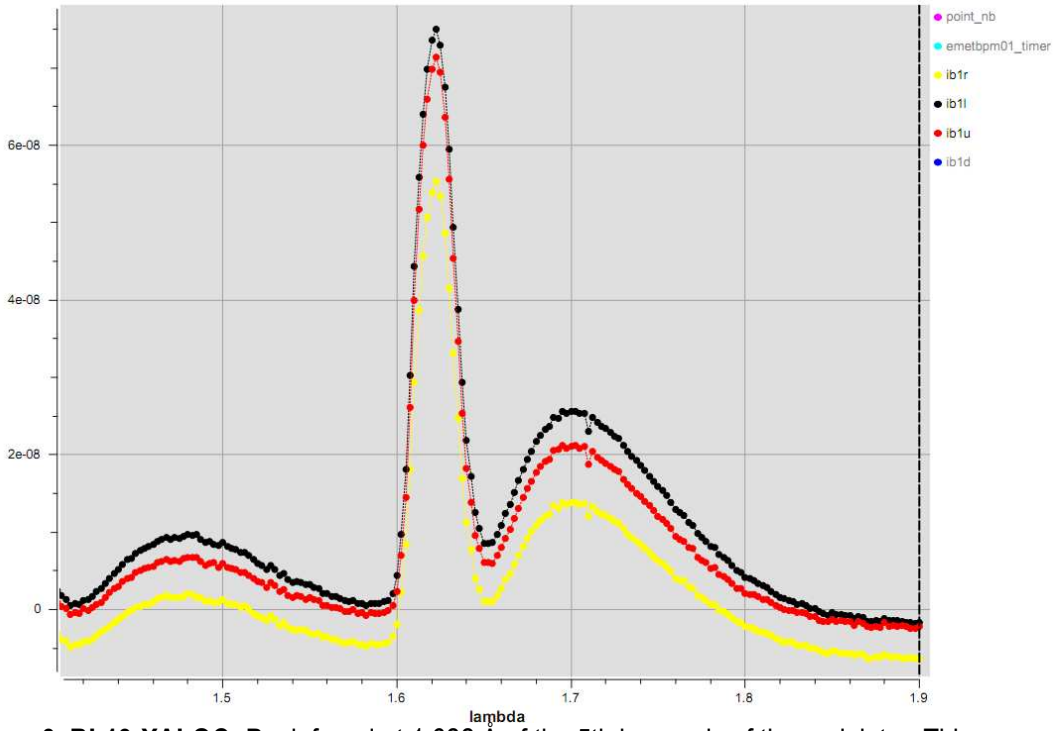

Figure 3. BL13-XALOC: Peak found at 1.622 Å of the 5th harmonic of the undulator. This was measured with XBPM1, a 4-diode beam monitor located right after the monochromator. The undulator gap is 5.7 mm, storage ring current ~ 15 mA.

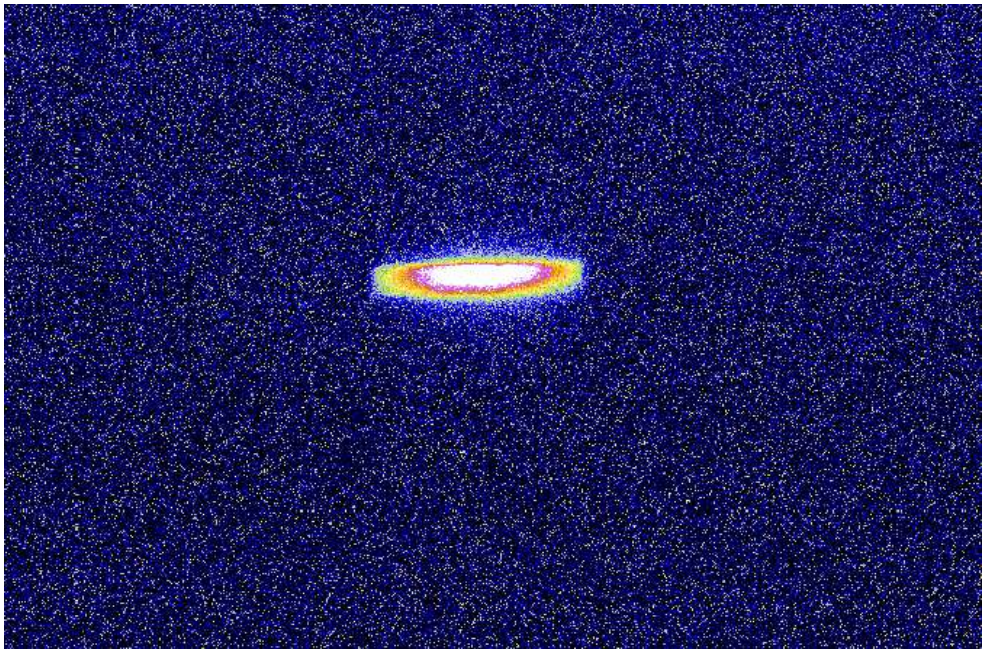

Figure 4. BL13-XALOC: First monochromatic beam observed in the second fluorescence screen of the optics hutch of XALOC. This fluorescence screen sits right before the photon safety shutter and the experimental station. This beam corresponds to an energy of ~ 7.656 keV which is the 5th harmonic of the undulator (5.7-mm gap) and a storage ring current of ~ 22 mA.

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

- The control cabin now hosts the BL operators (See Fig. 1).

- On October 28th we got the first absorption spectra measured. Figures 2 and 3 show the first spectra of copper foil at the Cu K-edge measured in fluorescence mode by the 4-diode beam position monitor (BPM). The XANES spectra are with constant dE steps of 0.5 eV and acquisition time 0.25 s per point. The EXAFS spectra are with constant dk steps of 0.025 $Å^{-1}$ and acquisition time $\propto k^2$ (0.1 to 0.7 s per point, ~12 min in total). The comparison is made with the spectra measured at Hasylab/E4 beamline in transmission mode, see Figs. 2 and 3. The washed-out absorption features are due to the self absorption effect which cannot be corrected here because the fluorescence is not normalized to the incident intensity (the BPM itself is an I0 monitor and there is none other upstream of it). The increasing trend is due to decreasing absorption in the used 1-mm-thick carbon filter.

Figure 1. BL22-CLAESS: BL22's control cabin. The green door at the left is entrance to the experimental hutch. The photograph was taken at the entrance to the Chemistry Lab that will be used for sample preparation/mounting.

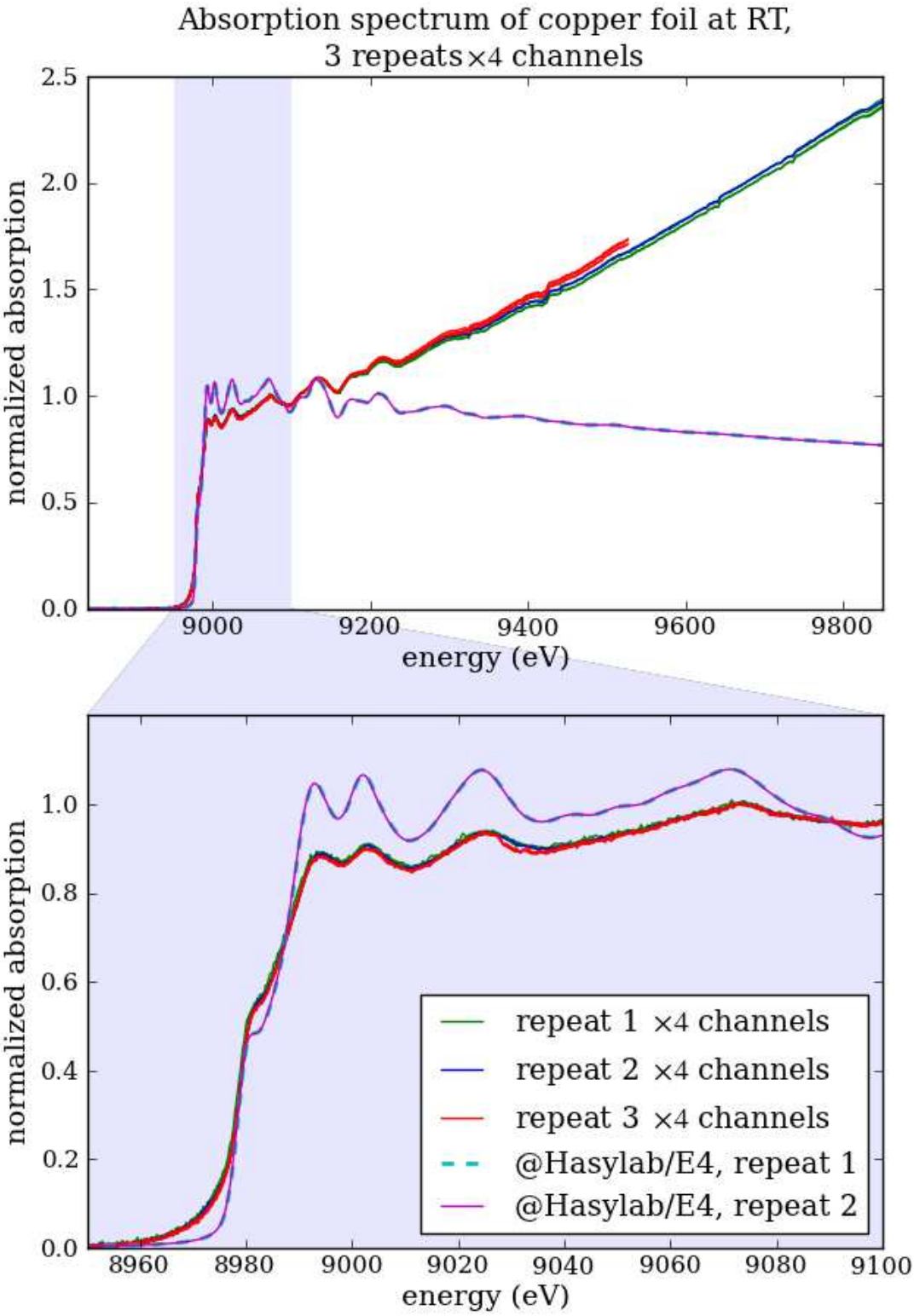

Figure 2. BL22-CLAESS: Absorption spectra of copper foil at the Cu K-edge. The XANES part is magnified.

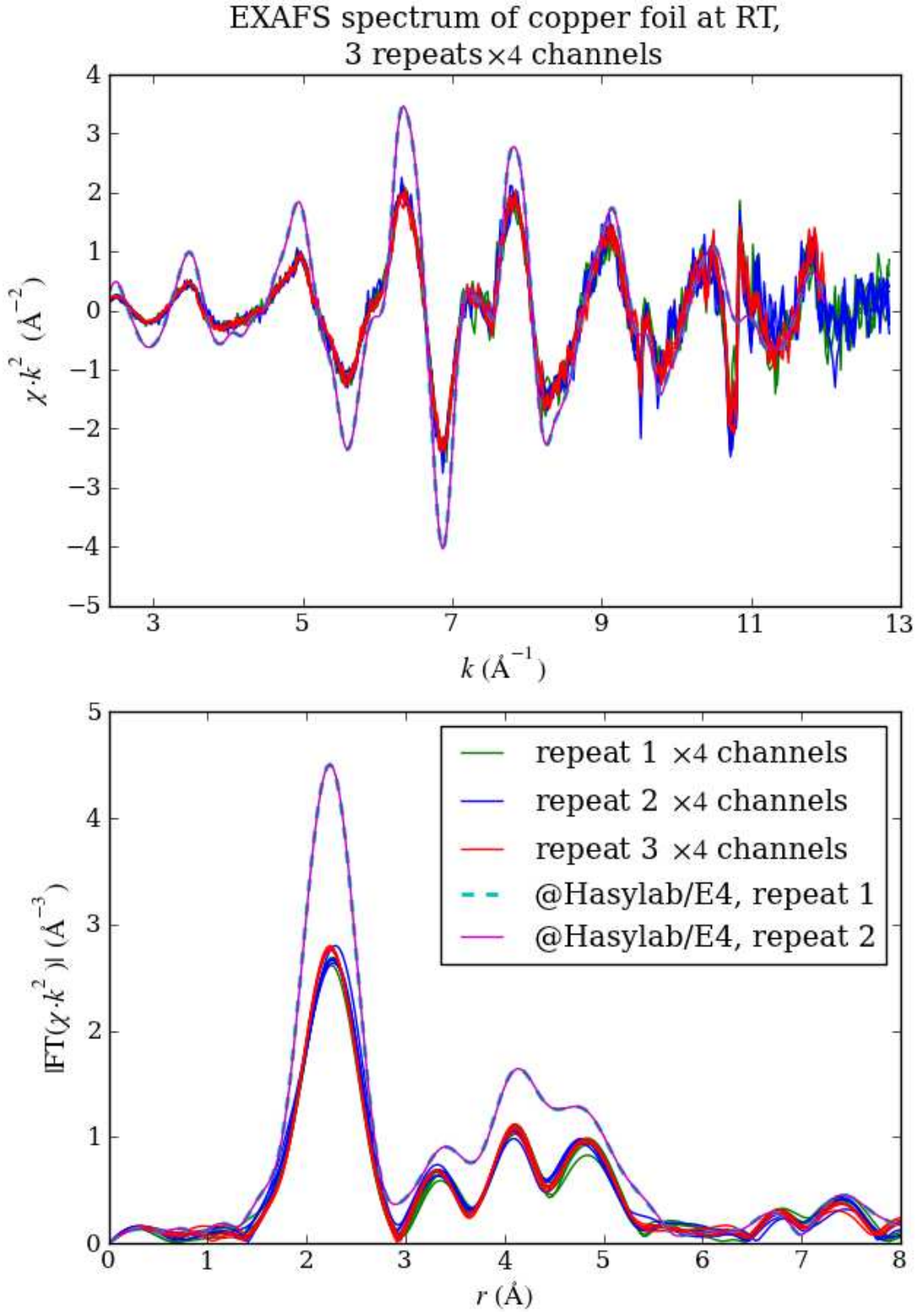

Figure 3. BL22-CLAESS: EXAFS spectra of copper foil at the Cu K-edge in *k*- and *r*- spaces.

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

- During commissioning with x-rays we have successfully passed the first mirror, the Bremsstrahlung collimator, the monochromator, and the branching mirrors, that deflect the beam into the two different branches (See Fig. 1).

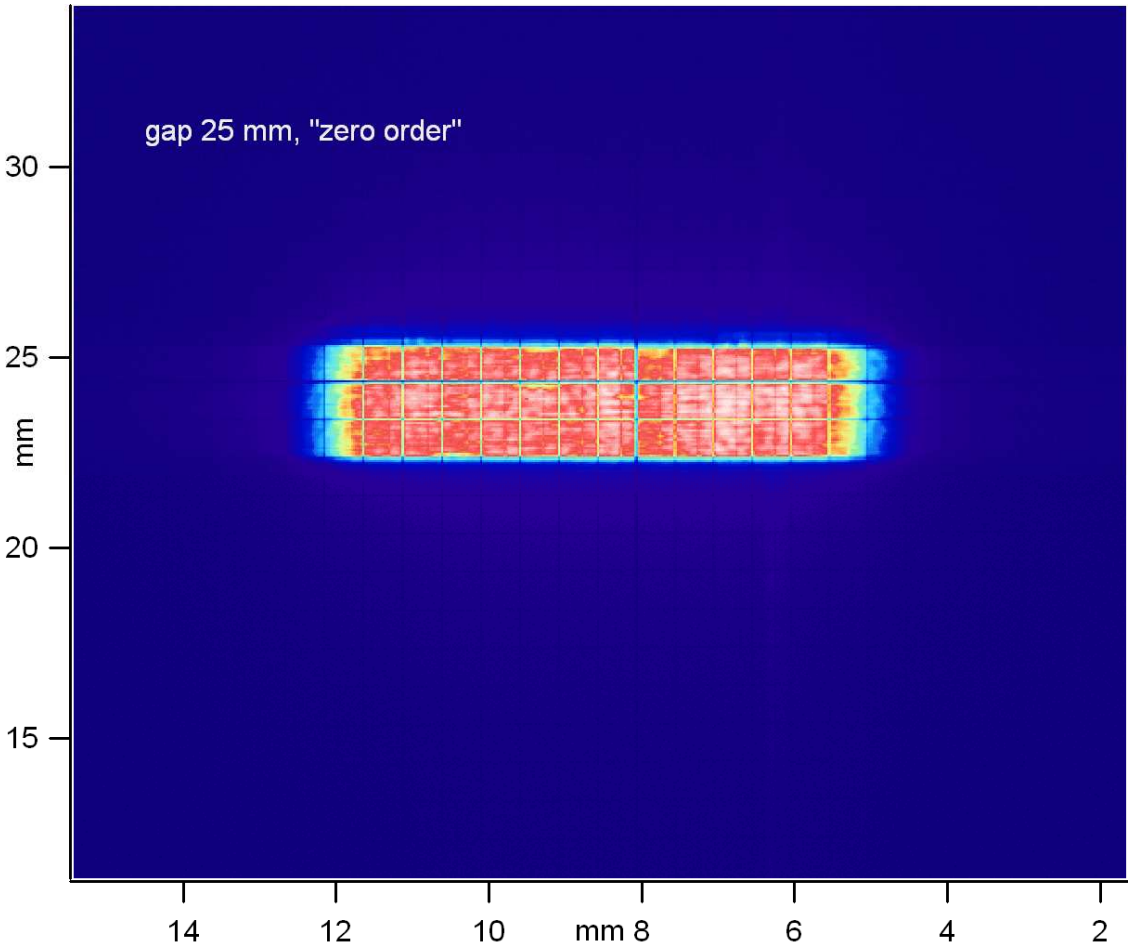

Figure 1. BL24-CIRCE: Zero order beam spot at a fluorescent screen monitor downstream of the monochromator.

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

- The beamline commissioning with an x-ray beam has started. After 24 hours the beam reached the final element currently installed, the gas cell. We could measure the first test XAS scans. We are now optimizing all optical elements. The progress of the commissioning can be followed at the web page of Boreas at the address http://www.cells.es/Beamlines/VP/, where pictures of the beam are also available.

- The motors of the refocusing KB mirror system have been reinstalled and currently the calibration of the benders is being performed in the LTP of the Optics and Metrology Laboratory.