BM16 AND NON CRYSTALLINE DIFFRACTION: 18 MONTHS OF USER OPERATION

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BM16 is a so-called Cooperative Research Group (CRG) bending magnet beamline of the European Synchrotron Radiation Facility (ESRF) based in Grenoble. BM16 is operated by the Spanish consortium Laboratory Llum Sinchrotro (LLS) with head in Barcelona. The CRG-beamline concept aims in improving access to the ESRF for the Spanish synchrotron users community. CRG-beamtime on BM16 is granted all over the year and is scheduled with reduced delay following proposal submission. These conditions are particularly attractive for both newcomers in the synchrotron radiation techniques and for experienced users with longer term projects requiring multiple data collection sessions. BM16 shares two experimental stations dedicated to Protein Crystallography (PX) and Non-Crystalline Diffraction (NCD) techniques. Whereas the PX station is operating since 2003, the NCD branch opened access to first CRG users in April 2006. During the 18 months operation, BM16-NCD hosted experiments of 15 Spanish user groups.

BM16 can operate in the 5-17keV energetic range. Energy selection is achieved using a double Si111 crystal monochromator positioned 28m downstream the bending magnet source. The upper limit in energy is imposed by the 3.8 mrad grazing incidence angle of the fist Rh coated mirror placed ~2.5m before the monochromator. Contrary to PX experiments, the first mirror is not used in vertical collimating mode for NCD experiments, this results in an energy resolution deltaE/E~7 10-4 (against 1.5 10-4 in PX mode). Vertical and horizontal focusing of the beam at NCD detector position is achieved using the 2nd, toroidal-shaped, Rh coated mirror placed ~2.5m after the monochromator. In optimum conditions, we obtain a ~0.3*0.8mm2 FWHM focus spot at the detector position (25-33m from mirror 2 position). At the maximal sample to detector distance of 6 meter, awe can access a 100 nm real spacing resolution. Beamline vacuum (<10-6 mbar) is preserved up to the sample position, whereas a 1-to-6 meter tunable evacuated chamber (~2*10-1 mbar) ensure for minimal air scattering background.

The 2-dimensional detector presently used for SAXS experiments is a MarCcd165 which consists of 2048*2048 pixels of 80 micron effective size. Drawback of the detector is the readout time of ~3secs/frame which prevents (fast-) time resolved experiments. A second detector, mounted on a 2Theta arm circle and positioned at 250-450mm from the sample, can be used for WAXS data collection. This detector is the PI SCX90-1300 from Roper Scientific consisting of a 1242*1152 pixels array of 50 micron effective size. Note that SAXS and WAXS data can be simultaneously collected.

In the presentation, I will further develop the beamline possibilities and show typical examples of experiences done on BM16_NCD during the 18 months of user operations.