ID22 High Resolution Powder Diffraction Beamline at ESRF

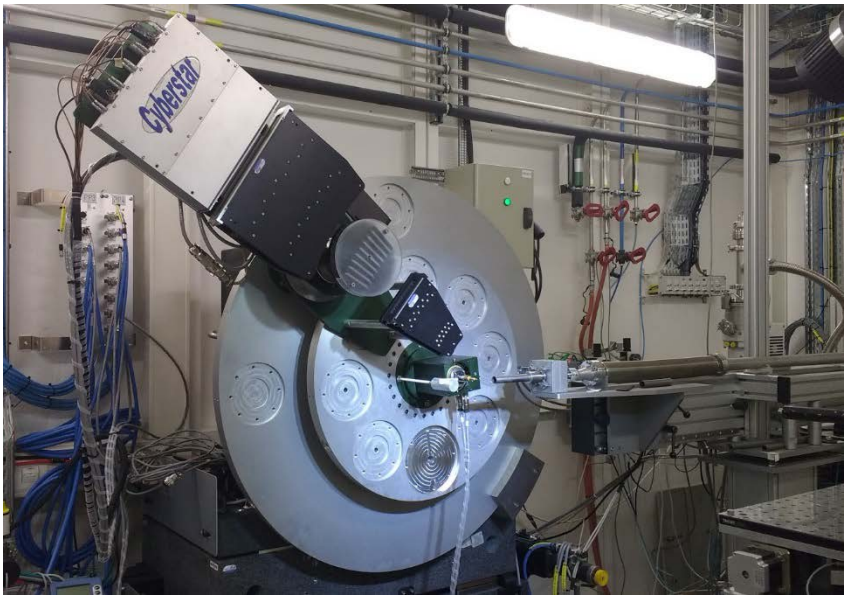
Andy Fitch

ESRF, CS40220, 38043 Grenoble Cedex 9, France

fitch@esrf.fr

The 6 GeV European Synchrotron Radiation Facility in Grenoble has operated a high resolution powder diffraction beamline since May 1996. Originally built on bending magnet BM16, and moved in 2002 to insertion device ID31, since 2014 the beamline has been located at ID22, with an in-vacuum undulator source. The beamline produces very high resolution powder diffraction patterns at relatively hard photon energies, with routine operation in the range 25 – 40 keV, (λ = 0.5 – 0.3 Å), thus allowing the use of capillary specimens without worries about sample absorption for a wide range of sample types. In 2015 a Perkin Elmer XRD 1611 medical-imaging detector was installed to provide data to high Q (25 – 30 Å^{-1}) for PDF analysis at energies up to ≈70 keV. In 2017 a new powder diffractometer, based on air-bearing technology, replaced the original machine that had operated reliably for more than 20 years.

On 10 December 2018 the ESRF storage ring ceased operation and is being replaced by a new, low-emittance storage ring of the new generation, offering greatly enhanced brightness. Full user operation will resume in August 2020, though on ID22 we expect to restart experiments for industrial and in-house projects well before that. The deadline for user proposals is 1 March 2020. On ID22 we will be replacing the bank of nine scintillation counters behind the nine-crystal multianalyzer stage with a Dectris Eiger-2 pixel detector with CdTe sensor. Tests [1] made with a Pilatus detector showed that there are advantages for high resolution powder diffraction by adopting this approach, including improved resolution and peak shape at low angle, improved statistics at high angle, improved signal to noise, filtering of bright diffraction spots from a grainy sample for improved powder averaging, etc. Along with the new-generation ring, this should lead to significant improvements for the quality of powder diffraction data.



ID22 high resolution powder diffractometer

[1] Dejoie *et al. J. Appl. Cryst.* **51,** 1721-1733, (2018).