Hard X-ray microscopy at the Diamond Imaging and Coherence Beamline I13

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The coherence and imaging beamline I13L is dedicated to hard X-ray microscopy either in direct or reciprocal space. For both, lens and lensless imaging, two independent stations are operated at a distance of 250m from the source. The coherence length can be adjusted over a large range by a modification of the electron beam in the storage ring and slits in the front-end. The imaging branch is dedicated to In-line phase contrast imaging and tomography over a large field of view in the 6-30keV energy range. In addition it will be possible to switch to full-field microscopy with 50nm spatial resolution.

Resolution beyond the limitations given by the detector and X-ray optics is achieved with techniques working in the far field. For crystalline samples Coherent X-Ray Diffraction allows not only to reconstruct the shape of nano-crystals but also to provide 3D information about parameters such as internal stress. Other Coherent Diffraction Imaging techniques such as ptychography are also implemented on the same ‘coherence’ branch.

For the beamline several original developments in the area of detectors, beamline optics and instrumentation have been carried out, such as for example the photon counting Excalibur detector.

The coherence branch is operational since October 2011, the imaging branch from April 2012.

The latter is part of the Diamond-Manchester partnership.

We will present our first scientific results achieved as well as new technical developments.

References