We present here the recent developments and increases in performance of ptychographic imaging at the Coherence Branch of I13 at the Diamond Light Source.

The experimental hutch offers great flexibility and allows for the operation in several modalities; with detectors available in both near and far-filed geometries, as well as in off-axis, Bragg, positions with the robot diffractometer system. The large coherence width of the beam in the hutch, coupled with the selection of condensing optics, allows for beam sizes in the sample plane from 100’s of nms up to 10’s of ums. The resulting setup provides quantitative phase imaging at resolutions down to 30nm and across regions of up to 500um.

Ptycho-Tomography development has seen the EXCALIBUR project collecting frames at over 100fps, motion programs recording ptycho-tomographic data at 10’s of frames per second, with integrated alignment, collection, reconstruction, and analysis software. A recent highlight has been the high resolution imaging of nanocellular polymers, with gas structures in the nanoscale (30-500 nm), resulting in the first reported 3D tomographic characterization of these new promising materials and their enhanced physical properties.

References

Figure 1: Ptycho-Tomography reconstruction from a nanocellular polymer sample, showing a 3D rendering (left) and a single reconstructed slice (right).