The ptychographic sampling condition and decomposition of mixed states

D.J. Batey

Department of Electronic and Electrical Engineering, University of Sheffield, S1 3JD, United Kingdom

Ptychography has often been viewed as an extension to the single-shot coherent diffractive imaging (CDI) technique - a way in which to remove the complex conjugate ambiguity and to image extended specimens across an indefinite field of view. In fact, the introduction of a real-space scanning stage to the diffractive imaging process offers a whole new sampling condition, one in which the requisite pixel-pitch in reciprocal-space is no longer limited solely by the lateral extent of the illuminating beam [1]. Instead the conventional sampling condition for each exposure may be relaxed substantially through a reduction in the real-space scanning pitch even when the detector is composed of large integrating pixels [2].

Recent developments in the reconstruction algorithm has provided new ways of exploiting the rich sampling framework that ptychography offers. The decomposition of incoherently mixed states within detector pixels not only significantly relaxes the experimental constraints and stability requirements for diffractive imaging but also opens up new possibilities of imaging multiple states within datasets.

Results from the I13 coherence branch at the Diamond Light Source relating to the ptychographic sampling condition will be presented along with some work on mixed state ptychography through multiple wavelength illumination in the visible light regime [3].

References

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Email corresponding author: elp10db@shef.ac.uk