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High Resolution Soft X-ray Ptychography at the Cryo STXM endstation, Spectromicroscopy (SM) Beamline, Canadian Light Source.

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Ptychography is a lensless X-ray diffraction microscopy technique [1,2,3] in which the sample is scanned at pre-defined positions collecting far-field diffraction patterns at each of these scanning positions. The diffraction patterns along with the information regarding the scan positions are then processed using iterative phase retrieval algorithms resulting in high resolution complex transmission function of the sample. Unlike techniques like transmission X-ray microscopy (TXM), Fourier transform holography (FTH) or scanning transmission X-ray microscopy (STXM), the resolution doesn't depend on the focusing optics or the reference aperture, but on the detectable signal contained in the measurable inverse space. While other parameters such as beam stability and stage accuracy play an important role, the fundamental limitation on obtainable resolution is the measurable inverse space. We have implemented an experimental geometry wherein the detector in the Cryo STXM endstation can be positioned at 35 mm behind the sample. This enabled us to carry out high resolution ptychography at the Cryo STXM endstation of the soft X-ray spectromicroscopy beamline, Canadian Light Source [4]. We will report on the experimental and algorithmic details of the imaging setup along with the results obtained. We will also take this opportunity to report on the newly acquired in-situ, in-operando capabilities of the SM beamline.

References

- [1] J. M. Rodenburg, et al., Physical Review Letters, 98(3):1-4, (2007)
- [2] P. Thibault, et al., Science 379 379-383 (2008)
- [3] V.S.C. Kuppili, et. al., Journal of Physics: Conference Series (2017)
- [4] A.F.G. Leontowich, et. al., Review of Scientific Instruments 89, 093704 (2018)

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