

X-ray ptychography: a powerful tool for imaging

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X-ray ptychography [1] has attracted a lot of attention in the last years because of its capability to produce images with a resolution that is not limited by lenses. This is especially appealing when using X-ray energies above a few keV, due to the challenge to fabricate high-resolution aberration-free lenses in this energy range. In fact, X-ray ptychography is much more than just a high-resolution imaging technique. Its capability to provide phase images with quantitative contrast, deconvoluted from the typically imperfect X-ray illumination, is often enough for users to choose this technique as a tool to investigate their samples due to the high quality of the images.

The implementation of X-ray ptychography is challenging due to requirements such as a coherent illumination, incident beam stability, optics-sample relative stability on the nanometer scale, and special data processing. At the cSAXS beamline at the Swiss Light Source we have developed data acquisition strategies, instrumentation and data post-processing algorithms for efficient ptychographic imaging. Our main aim is to provide a tool for users who are not familiar with the technique but can benefit enormously from it.

In this presentation we will show how our developments have successfully enabled the implementation of X-ray ptychography as a tool for users. We will show applications of in-situ 2D [2] and ex-situ 3D [3] ptychographic imaging, cryogenic imaging, [4] and high-resolution 3D imaging [5]. Furthermore, we will present our latest work towards exploiting high-brilliance synchrotron sources for even more efficient ptychographic imaging in the future, which anticipates some challenges and opportunities.

References

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