

Ptychography in TPS 25A1

Yi-Wei Tsai (蔡一葦)¹, Chun-Yu Chen (陳軍佑)¹, and Jhih-Min Lin (林志敏)^{1*}

¹National Synchrotron Radiation Research Center, 101 Hsin-Ann Road, Hsinchu Science Park, Hsinchu, Taiwan

tsai.yw@nsrrc.org.tw

Abstract

Ptychography, the scanning coherent diffraction image (CDI) techniques, has been tested in TPS 25A1. When the coherent X-ray source with photon energy of 5.2 keV is illuminated on a sample, the sample (called object) modulate the amplitude and the phase of the EM wave of the incident beam (called probe function). The modulated EM wave just behind the sample is called the exit wave, and it propagates onto a detector to generate a special coherent scattering pattern. The patterns can be used to retrieve the exit waves, the probe function and the object by the iterated algorithm, the so-called coherent diffraction imaging technique. The retrieving software with graphical user interface (GUI) is developed by MATLAB, including several algorithms to improve the retrieved image quality, such as the position correction method for the position errors, multi-probe method for the partial coherent issue of the incident X-ray and the probe-extend method for the incensement of the over-sample ratio. The best resolution is around 50 nm on the testing sample. Besides, the retrieved images of real samples are also obtained.

Keywords – Coherent diffraction image, Ptychography.