

Design of a Multi-axis Mechanism for Zone Plate with High Stability

Tsung-Wen Chen (陳宗堯)¹, Duan-Jen Wang, (王端正)¹, Zi-Jing, Lin (殷廣鈞)¹, and Lee-Jene Lai (賴麗珍)^{1*}

¹National Synchrotron Radiation Research Center, 101 Hsin-Ann Road, Hsinchu Science Park, Hsinchu, Taiwan
jene@nsrrc.org.tw

Abstract

In TPS 24A beamline, soft X-ray tomography (SXT) is used to image the biological specimen. SXT technique with high resolution of 30 nm is our goal to visualize the ultrastructure of biological specimen in near native cellular structure. Zone plate is an optical focusing element. Stability of the zone plate adjustment mechanism plays a key role in the image quality.

A zone plate needs high stability of each stage which makes the mobility process difficult and reduces the reconstructed image quality. However, focusing light or other things exhibiting wave character in SXT is very difficult and complicated. To meet such high resolution, we designed and constructed an adjustment mechanism for zone plate. It is high vacuum compatible and up to 5 axis motions, includes 3 translation and 2 angular motions. Therefore, it is required to improve the vibration and stability of zone plate stage to obtain a good quality of SXT images.

In this poster, we will discuss and test performance of design criteria of the stability and the vibration of zone plate stage.

Reference:

- [1] Y.Suzuki, A.Takeuchi, H.Takano, andH.Takenaka, "Performance test of fresnel zone plate with 50 nm outermost zone width in hard X-ray region," Japanese J. Appl. Physics, Part 1 Regul. Pap. Short Notes Rev. Pap., vol. 44, no. 4 A, pp. 1994–1998, 2005.
- [2] W.Yun et al., "Nanometer focusing of hard x rays by phase zone plates," Rev. Sci. Instrum., vol. 70, p. 2238, May1999.
- [3] A. N.Meyer G, "Novel optical approach to atomic force microscopy," Appl. Phys. Lett., vol. 53, no. 12, pp. 1045–1047, Sep.1988.
- [4] B.A, "Fresnel Zone Plate for Optical Image Formation Using Extreme Ultraviolet and Soft X Radiation," J. Opt. Soc. Am., vol. 51, no. 4, pp. 405–412, 1961.

Keywords - List key keywords here. No more than 5.