

Accuracy Evaluation of the X-ray interferometer for EUVL Optics

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Extreme ultraviolet lithography (EUVL) is expected as the next generation technology. EUVL projection optics has NA0.2-0.3 and the wavefront aberration must be less than 0.5 nm rms. In order to fabricate such accurate optical system, higher accurate, e.g., 0.1 nm rms, wavefront metrology tool is required. In EUVA, at-wavelength interferometer for wavefront metrology has been studied. Recently we evaluated absolute measurement accuracy and obtained good results.

Figure 1 shows the point diffraction interferometer (PDI) built at NewSUBARU. Wavelength is 13.5 nm and the test optics is Schwarzschild optics with NA0.20. Wavefront from the 1st pinhole is separated by the grating to two. One through the window is the wavefront to be tested. The other through the 2nd pinhole with 50 nm ϕ becomes spherically reference wavefront. These two interfere on CCD. Wave front aberration can be obtained by analyzing the interferogram.

Absolute accuracy of the interferometer has been evaluated by the following. Measured data is composed of the real wavefront and the systematic error. By rotating the test optics, real wavefront to be tested rotates with the test optics and the residual component is the systematic error. Figure 2 shows the wavefront before and after 90 degree rotation. Both show similar wavefront shapes. Systematic error can be estimated from the difference wavefront by some calculations and as about 0.10 nm rms.

Acknowledgement

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Reference

T. Hasegawa et. al., Proc SPIE , vol. 5374 (2004) 797-807

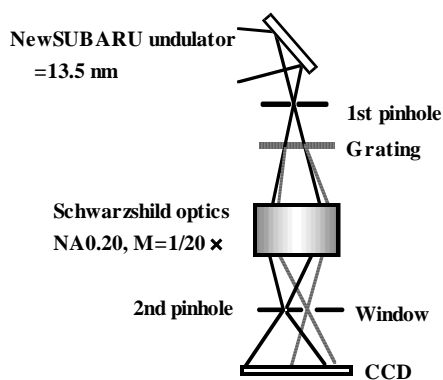


Figure 1. Concept of the PDI.

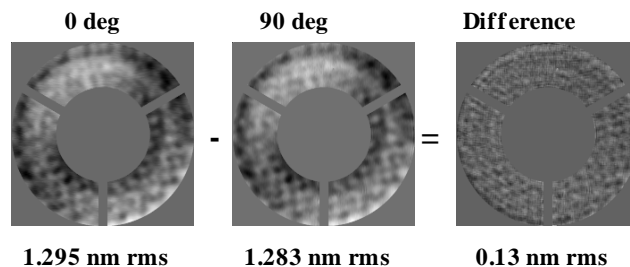


Figure 2. Measured wavefronts and the difference.