



22nd November 2011 - 11:00 a.m.
DESY building 49 - seminar room (108)

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Zone plate focused soft X-ray lithography

The current generation of soft X-ray scanning transmission X-ray microscopes (STXM) routinely focuses monochromatic soft X-rays into sub-30 nm spots (Rayleigh criterion) using Fresnel zone plates. We use this fine X-ray beam to pattern photoresists (polymers) in a manner analogous to lithography with a focused electron or ion beam¹.

We encountered an exposure spreading phenomenon when patterning with high doses, which caused our patterned features to be much wider than anticipated. We determined the exposure spreading mechanism to be due to the point spread function of the zone plate lens itself. By making a series of single shot exposures in a photoresist at focus over a controlled dose range we can effectively measure the point spread function of a soft X-ray zone plate in three dimensions². We demonstrate how this novel measurement is sensitive to aberrations of zone plates, and discuss how the information could be valuable feedback toward optimizing zone plate lens fabrication. Unique applications of zone plate focused soft X-rays will also be discussed.

1. A.F.G. Leontowich, A.P. Hitchcock *Appl. Phys. A* 2011 103, 1-11.

2. A.F.G. Leontowich, A.P. Hitchcock *Proc. of the SPIE* 2011 8077, 80770N-1.