

# Lawrence Berkeley National Laboratory

## Recent Work

### **Title**

Achieving diffraction-limited EUV aerial image microscopy

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### **Publication Date**

2008-09-26

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5. EUVL topic (check only one by "X")	<input type="checkbox"/> Exposure Tools (ET) <input type="checkbox"/> Optics & ML Coatings (ML) <input type="checkbox"/> Sources (SO) <input type="checkbox"/> Optics Contamination (OC) <input type="checkbox"/> Resists (RE) <input type="checkbox"/> Device Integration (DE) <input checked="" type="checkbox"/> Masks (MA) <input type="checkbox"/> Technology Readiness (TR) <input type="checkbox"/> Defect Inspection (DI) <input type="checkbox"/> Cost of Ownership (CO) <input type="checkbox"/> Reticle Contamination (RC)	
6. Presentation preference:	<input checked="" type="checkbox"/> oral	<input type="checkbox"/> poster

7. Abstract body:

The SEMATECH Berkeley Actinic Inspection Tool (AIT) is a prototype EUV aerial image microscope dedicated to EUVL mask inspection. The AIT uses a conceptually simple optical system to focus mask-reflected light on a CCD detector with high magnification.

The AIT has a flexible design and light path that enables the use of zoneplates with different optical properties. However, the drawback of such flexibility is the need for frequent, careful, fine alignment to maintain optimal performance and minimize alignment-dependent aberrations. In order to improve the alignment procedures, and thus the performance and stability of the tool, we have developed a detailed ray-tracing model of the optical system, and image analysis tools that provide quantitative aberration feedback. Feedback enables us to correct misalignments with greater confidence, and to reach closer to the goal of diffraction-limited performance.

Advances in system alignment, and recent upgrades that include new zoneplates and a higher resolution CCD camera enable the AIT to achieve contrast values above 75% at 100-nm (mask) linewidth. New user-selectable zoneplates have higher magnification ratios than before, and 4x NA values from 0.25 to 0.35. We will describe our improved alignment strategy and the results of performance testing.

This work is sponsored by SEMATECH and conducted at Lawrence Berkeley National Laboratory.

Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231