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Zoneplate lenses for EUV microscopy

ABSTRACT:
While EUV lithography is a leading choice for reach the next nodes in microchip fabrication, EUV light is not very easy to deal with.

We operate the Sematech Berkeley Actinic Inspection Tool (AIT), a synchrotron based zoneplate-lens microscope for EUV mask inspection. This microscope is equipped with a set of zoneplates with different magnifications and numerical apertures. Each zoneplate is an off-axis holographic lens with hundreds zones made of gold patterned on a silicon nitride membrane. The AIT achieves high contrast imaging down to 88-nm mask patterns and smaller.

Like every kind of lens, zoneplates have advantages and limitations. We will describe our insights, methods, and real-world experience operating the AIT and optimizing its performance. We will cover the detailed zoneplates design considerations, order sorting, field of view, aberration compensation and minimization techniques, illumination, and stability; image degradation from scattering and stray light generated by mask patterns. We will also present new techniques to acquire stable through-focus series.

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