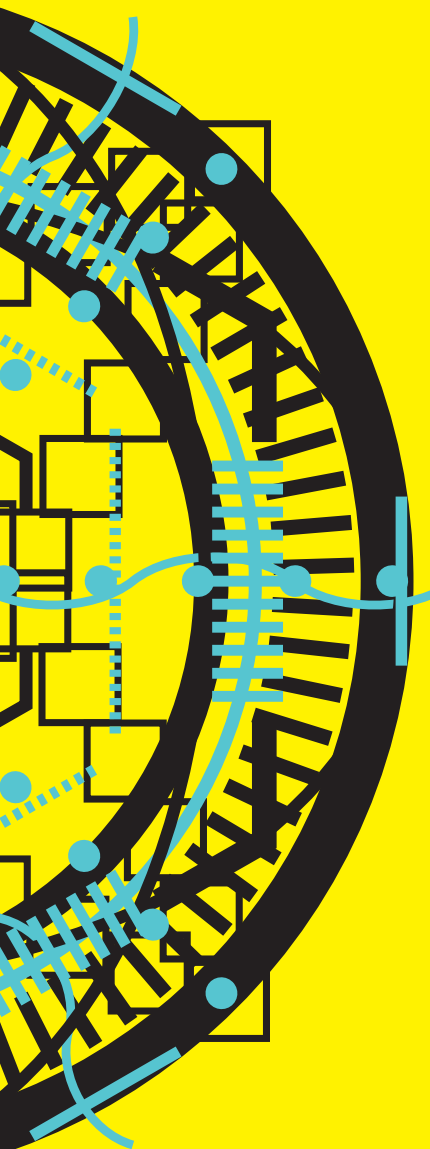




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European Technology Platform21,
2nd edition, May 2011



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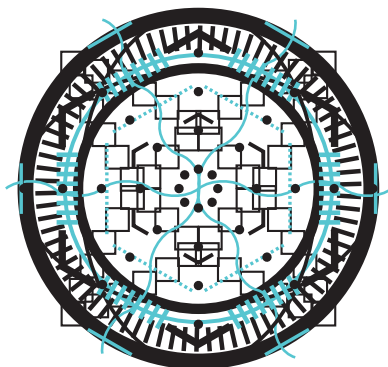


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Lens heating challenges for negative tone develop layers with freeform illumination: a comparative study of experimental vs. simulated results

Scott Halle ; Michael Crouse ; Aiqin Jiang ; Youri van Dommelen ; Tim Brunner ; Blandine Minghetti ; Matt Colburn ; Youping Zhang ; Will Conley
(+) Author Affiliations

Proc. SPIE 8326, Optical Microlithography XXV, 832607 (March 1, 2012); doi:10.1117/12.916312

From Conference Volume 8326

Optical Microlithography XXV
Michael Crouse ; Aiqin Jiang ; Youri van Dommelen ; Tim Brunner ; Blandine Minghetti ; Matt Colburn ; Youping Zhang ; Will Conley
SPIE Proceedings | February 12, 2012

Abstract References

Abstract

Negative tone development (NTD) processes have been widely explored as a way to enhance the printability of dark field features such as contact holes and trenches. A key consequence of implementing NTD processes and subsequent tone reversal of dark field reticles is the significantly higher transmission of bright field masks and thus higher light intensity in the projection optics. This large increase in mask transmission coupled with the higher throughput requirements of multiple patterning and the use of freeform illumination created by source mask optimization creates a significant amount of lens heating induced aberrations that must be characterized and mitigated. In this paper, we examine the lens heating induced aberrations for high transmission reticles common to NTD using both simulations and experiments on a 193 immersion lithography tool. We observe a substantial amount of aberrations as described by even and odd order Zernike drifts during the course of a wafer exposure lot. These Zernike drifts per lot are demonstrated to have the following lithographic effects: critical dimension shifts, pitch dependent best focus shifts and image placement errors between coarse and fine patterned features. Lastly, mitigation strategies are demonstrated using various controllers and lens manipulators, including FlexWave with full Zernike control up to Z64, to substantially reduce the lens heating effects observed on-wafer.

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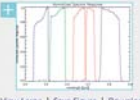
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Special Section On Terahertz And Millimeter Wave Imaging

Image plane coded aperture for terahertz imaging

Orges Furxhi ; Eddie L. Jacobs ; Chrysanthre Preza

[+] Author Affiliations

Opt. Eng. 51(9), 091612 (doi:10.1117/1.OE.51.9.091612)

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Abstract

Abstract | Introduction | Two-Dimensional Image Plane Coded Aperture | Image Reconstruction | Implementation Of The Image Plane Coded Aperture And Imaging Setups | Results | Conclusions | References

Abstract.

In the absence of detector arrays, a single pixel coupled with an image plane coded aperture has been shown to be a practical solution to imaging problems in the terahertz and sub-millimeter wave domains. The authors demonstrate two laboratory, real-time, two-dimensional, sub-millimeter wave imagers that are based on an image plane coded aperture. These active imaging systems consist of a heterodyne source and receiver pair, image forming optics, a coded aperture, data acquisition hardware, and image reconstruction software. In one of the configurations, the target is measured in transmission, while in the other it is measured in reflection. In both configurations, images of the targets are formed on the coded aperture, and linear measurements of the image are acquired as the aperture patterns change. Once a sufficient number of linearly independent measurements are obtained, the image is reconstructed by solving a system of linear equations that is generated from the aperture patterns and the corresponding measurements. The authors show that for image sizes envisioned for many current applications, this image reconstruction technique is computationally efficient and can be implemented in real time. Measurements are collected with these systems, and the reconstruction results are presented and discussed.

Introduction

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The interest in terahertz imaging is motivated by the ability of terahertz (THz) frequencies to penetrate most manmade materials, particularly clothing.¹⁻³ Additionally, many harmful

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