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A PRACTICAL INTERFEROMETRIC TECHNIQUE FOR MASK/WAFER  
ALIGNMENT DURING PROXIMITY PRINTING(U) NAVAL OCEAN  
SYSTEMS CENTER SAN DIEGO CA J L BARTELT ET AL. MAY 87

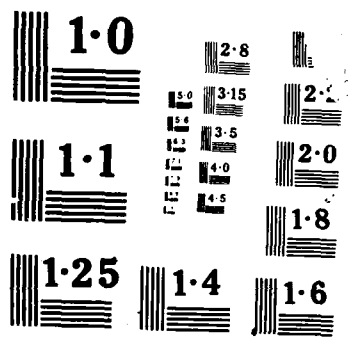
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| 12. PERSONAL AUTHOR(S)<br><br>I. Lagnado                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                              |                                                       |                                                                                                       |                                     |
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| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)<br><p>A new automated technique for sensing translational/rotational mask-to-wafer alignment will be presented that is useful with proximity printing processes such as masked ion beam or x-ray lithography. The technique is based on computer interpretation of fringe patterns created by laser beams diffracted from unique grating structures on both the mask and the wafer. It requires no moving parts and features a simple optical configuration that uses a dielectric cube beamsplitter to recombine the diffracted beams. Being an interferometric technique, precision better than 20 nm is easily achieved, while the novel grating structure and fringe analysis provides a capture range in excess of 20 <math>\mu</math>m. Additional key features of the technique are that it is insensitive to variations in the gap between mask and wafer and that its performance does not degrade with changes in surface reflectivity or topography as device wafers are processed. A single channel of the grating alignment technique has been implemented and tested in a laboratory bench fixture. The required mathematics, computer code, and experimental results will be discussed.</p> <p>This work was funded in part by the Naval Ocean Systems Center (NOSC) under contract number N66001-84-C-0110.</p> |                                              |                                                       |                                                                                                       |                                     |
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| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br><br>I. Lagnado                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                              |                                                       | 22b. TELEPHONE (include Area Code)<br><br>619-225-6735                                                | 22c. OFFICE SYMBOL<br><br>Code 5503 |

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A practical interferometric technique for mask/wafer  
alignment during proximity printing

by

J. L. Bartelt and R. D. Olney  
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3011 Malibu Canyon Road  
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Abstract

A new automated technique for sensing translational/rotational mask-to-wafer alignment will be presented that is useful with proximity printing processes such as masked ion beam or x-ray lithography. The technique is based on computer interpretation of fringe patterns created by laser beams diffracted from unique grating structures on both the mask and the wafer. It requires no moving parts and features a simple optical configuration that uses a dielectric cube beamsplitter to recombine the diffracted beams. Being an interferometric technique, precision better than 20 nm is easily achieved, while the novel grating structure and fringe analysis provides a capture range in excess of 20  $\mu\text{m}$ . Additional key features of the technique are that it is insensitive to variations in the gap between mask and wafer and that its performance does not degrade with changes in surface reflectivity or topography as device wafers are processed. A single channel of the grating alignment technique has been implemented and tested in a laboratory bench fixture. The required mathematics, computer code, and experimental results will be discussed.

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