Arial images phase measurement with the AIT: a new dimension in mask metrology

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The SEMATECH Berkeley Actinic Inspection Tool (AIT) is currently the highest-performance EUV actinic microscope dedicated to mask imaging. Analyzing AIT aerial images of patterned and blank masks we routinely study the detailed properties of pattern lines and various mask architectures, in addition to native and programmed substrate, multilayer, and absorber defects.

Recently we added a new dimension to the AIT's capabilities. We adopted an algorithm that allows us to quantitatively measure the full complex aerial image field, including phase, from two or more EUV images in a through-focus image series. We have successfully demonstrated the algorithm on an EUV phase shifting mask, and on known, native phase defects on blank and patterned masks. We will present our latest results on phase measurements and we will demonstrate the coupling of multilayer phase roughness into the measured aerial images. With sufficiently high resolution, these techniques can be adapted to other aerial image measurement tools with suitably high coherence illumination.

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