Lawrence Berkeley National Laboratory

Recent Work

**Title**
LER control and mitigation: Mask roughness induced LER aberrations sensitivity study and alter illumination scheme

**Permalink**
https://escholarship.org/uc/item/2np9g9vb

**Authors**
McClinton, Brittany
Naulleau, Patrick

**Publication Date**
2010-11-30
LER Control and Mitigation: Mask roughness induced LER aberrations sensitivity study and alter illumination scheme

Brittany McClinton and Patrick Naulleau

University of California, Berkeley

Lawrence Berkeley National Laboratory

In the push towards commercialization of extreme ultraviolet lithography (EUVL), meeting the stringent requirements for line-edge roughness (LER) is increasingly challenging. The extent to which aberrations effect mask roughness induced LER is not yet well understood. Here we conduct a mask roughness induced LER aberrations sensitivity study on the printing of features using the prime illumination candidates for both the 22-nm and 16-nm half pitch notes with the goal of providing LER control guidelines. Full 2D aerial image modeling for an imaging system with NA=0.32 was done for features on a rough mask with a replicated surface roughness (RSR) of 100 pm and a correlation length of 32 nm. We further considering an alternative source shape to provide LER mitigation for the 16-nm node; namely, a dipole that is extended to represent a strip. Preliminary results show that while this illumination provides nearly the same LER as a conventional dipole illumination, overall imaging quality in terms of ILS, NILS, and contrast is improved.

This work was supported by the Director, Office of Science, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.