University of Wisconsin EUV Exposure Stations

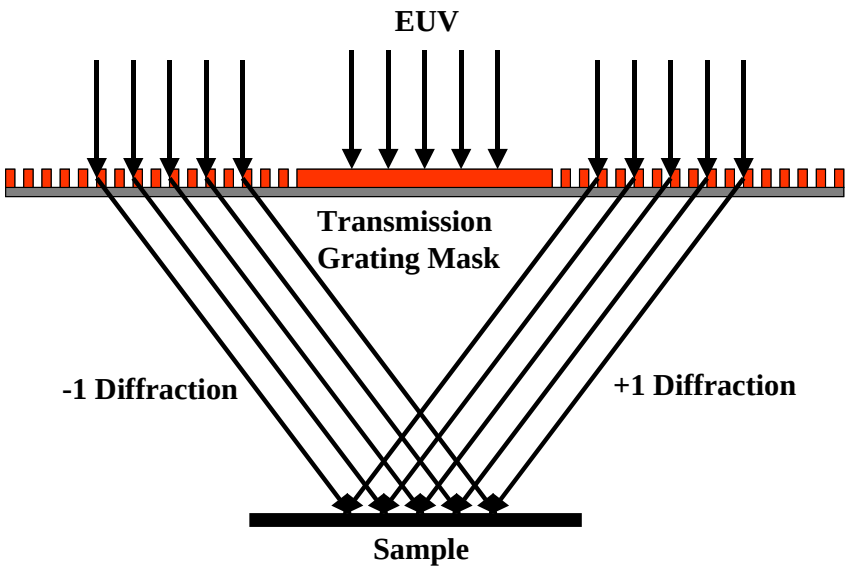
More than a Decade of Experience in:

- **Radiation Damage Studies:** Studying mask and optics lifetime and performance. These studies require prolonged exposures to simulate lifetime studies, and high flux is necessary to limit the length of time.
- **Resist Characterization:** Evaluation of candidate/experimental EUV resist sensitivity, resolution and LER, particularly where it is unknown if the material may contaminate the optics.
- **Resist Outgassing:** Evaluation of EUV resist effects on mask and chamber contamination.
- **Nanoscale patterning for materials research**

Point of Contact: Paul Nealey (nealey@engr.wisc.edu)

Resist Studies: EUV Interferometric Lithography

Two, three, or four diffracted beams interfere to yield dense lines and spaces, or cubic or hexagonal arrays of dots

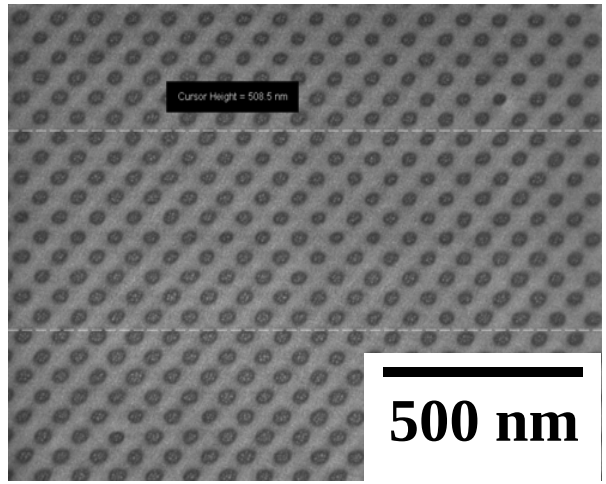


Pattern period is half of grating period

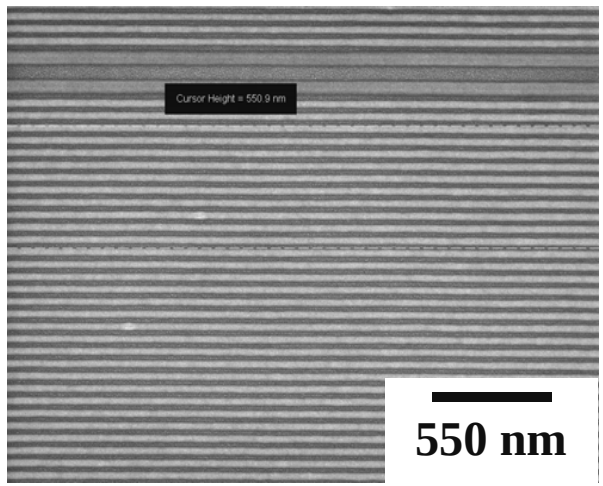
Collaboration with Harun Solak-Swiss Light Source

H. H. Solak, C. David, J. Gobrecht,
V. Golovkina, F. Cerrina, S. O. Kim and P. F. Nealey
Sub-50nm period patterns with EUV interference lithography,
Microelectronic Engineering 67-68 56-62 (2003).

PMMA



Cubic Array of Holes, 57 nm pitch



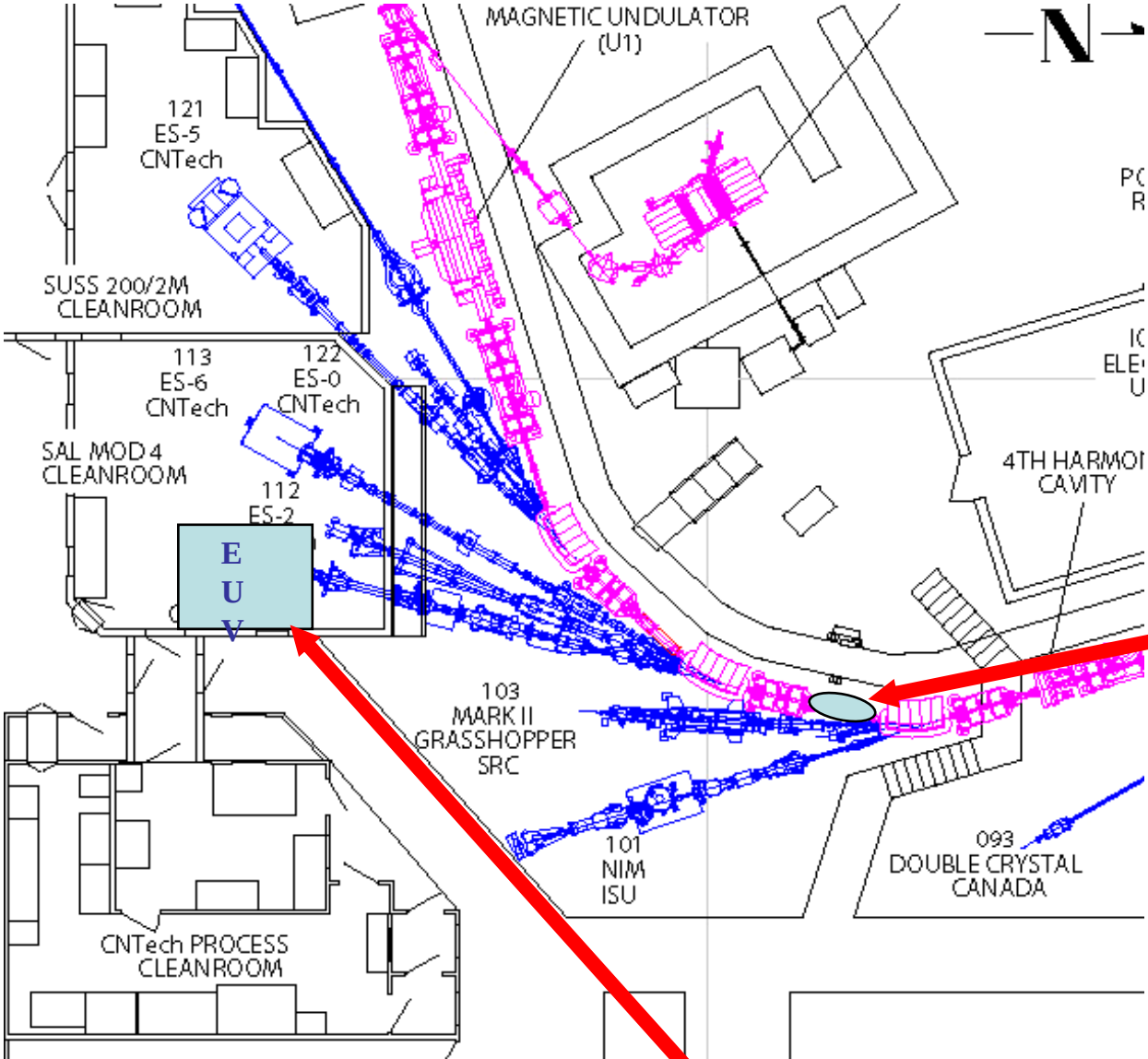
1:1 Lines, 55 nm Pitch

20 to 40 nm features in increments of 2.5 nm printed in each exposure

New EUV Lithography Insertion Device

- **Current EUV studies done on in timeshare on undulator with two other beamlines (33 % availability)**
- **Concept: a 1 meter insertion device in short straight section between bend magnets 10 & 11**
- **Dedicated beamline design more than compensates for shorter length than U2 (4x higher flux density)**
- **Provides EUV 100 % of time for radiation damage studies, resist characterization, resist outgassing, and nanoscale patterning for materials research in CNTech clean room**
- **Under procurement, installation in Spring 2006**

UW Synchrotron Radiation Center/Center for NanoTechnology



Dedicated Source

Exposure Stations in Clean Room

Beamline Milestones

- March 2005: Undulator fabrication awarded to Advanced Design Consulting USA, Lansing, NY
- July 2005: Final Design Review
- August 2005-February 2006: Fabrication of undulator, beamline, and experimental chamber components, infrastructure modifications
- February 2006: Factory testing and complete vacuum chamber installation
- March 2006: Delivery and final tests at SRC
- April 2006: Final Installation of undulator, beamline, and experimental chamber
- May-June 2006: Commissioning and first operations
- July 2006: Fully operational for routine beam time scheduling

Opportunities exist to:

• Build and install customized/private exposure chambers for use with the new EUV source

• Send researchers to the UW for short, medium and long term internships with full use of our entire research infrastructure

• Take advantage of supporting facilities and instrumentation at the UW for processing, metrology, and analysis.

• Contract expert UW staff to perform EUV experiments

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