

AGENDA

The workshop brings together experts from various fields of lithography simulation.

It provides an excellent opportunity to exchange ideas and discuss results and developments in:

- Computational EUV lithography: 3D mask, high NA and stochastic effects, resolution enhancement techniques, novel resist materials and phenomena
- Computational metrology and imaging for lithography: Deep learning and related techniques, mask characterization, hybrid optical models, SEM modeling, big data and novel methods for process characterization
- Modeling challenges and solutions for lithography applications beyond CMOS: 3D lithography and gray tone techniques for micro- and nanooptics, Si-photonics, bio-sensing, MEMS, ...

scatterometry mask defect inspection
interference lithography
high-NA EUV
new mask stacks
direct laser writing lithography
gray-tone lithography
3-D lithography GSAX
non-IC applications
EUV pellicle EUV DSA phase retrieval
ptychography stochastic effects
STED-inspired lithography
metrology for DSA

DIRECTIONS AND CONTACT

ADDRESS

Behringers Freizeit- und Tagungshotel
Behringersmühle 23, 91327 Gößweinstein, Germany

phone +49 9242 740030
www.tagungshotel-behringers.de

If you arrive by car:

- Coming from Frankfurt follow highway A3, take the exit Höchststadt-Ost, follow the B470
- Coming from Berlin follow highway A9, take the exit Pegnitz, follow the B470
- Coming from Munich follow highway A9, take the exit Pegnitz, follow the B470

If you arrive by airplane or by train, or if you require further information, please contact:

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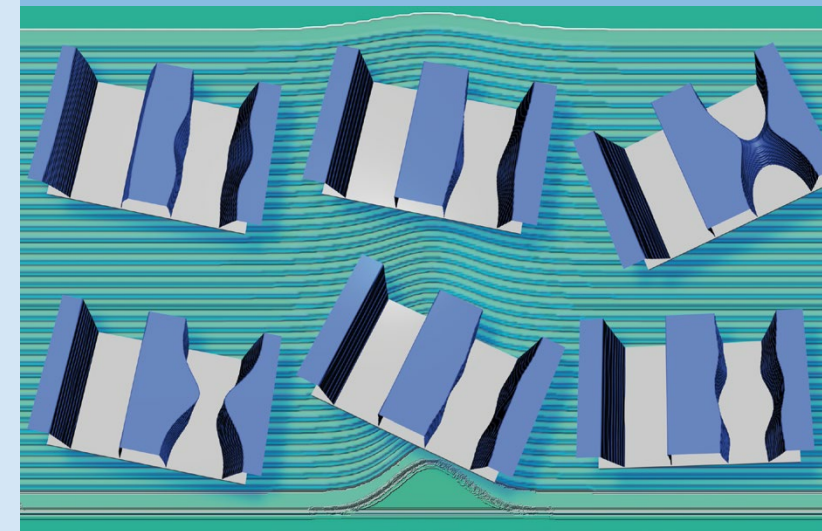
REGISTRATION

www.litho-workshop.com



17th FRAUNHOFER IISB LITHOGRAPHY SIMULATION WORKSHOP

September 26 – 28, 2019, Behringersmühle, Germany



PROGRAM

Thursday, September 26

18:00 *Welcome reception*

20:00 – **Welcome and introduction,**
20:15 A. Erdmann (Fraunhofer IISB)

20:15 – **A Rising Tide Lifts All Boats: Machine Learning**
21:00 **in the Context of Photomask Production,**
C. Utzny (AMTC)

Friday, September 27

09:00 – **Developing Methods for Studying Ultrafast EUV**
09:25 **Resist Kinetics for Improved Resist Modeling,**
R. Fallica¹, I. Pollentier¹, P. Vanelderen¹, B. Peterson²,
P. van der Heide¹, J. Petersen¹ (¹imec, ²KMLabs)

09:25 – **Pattern Formation Mechanisms of Metal**
09:50 **Oxide Nanocluster EUV Resists,** T. Kozawa
(Osaka University)

09:50 – **Calibration Strategy of Physical Stochastic EUV**
10:15 **Resist Models,** D. Ponomarenko, T. Mülders,
U. Welling, J. Tang, H.-J. Stock (Synopsis)

10:15 – 10:45 *Coffee break*

10:45 – **High NA EUV Lithography Simulation Using**
11:10 **New Calibrated Mo/Si Multilayer Model,**
M. Wu, I. Makhotkin, V. Philipsen (imec)

11:10 – **Pathfinding the Perfect EUV Mask: The Role**
11:35 **of the Multilayer,** H. Mesilhy¹, P. Evanschitzky¹,
G. Bottiglieri², E. van Setten², T. Fliervoet²,
A. Erdmann¹ (¹Fraunhofer IISB, ²ASML)

11:35 – **Extreme-Ultraviolet Refractive Optics,**
12:00 O. Kornilov, L. Drescher, T. Witting, M. Vrakking,
B. Schütte (Max-Born-Institut Berlin)

12:00 – 13:30 *Lunch*

13:30 – **Computational Metrology: Challenges and**
13:55 **Opportunities,** A. Fay¹, A. Forier¹, A. Girodon¹,
J.-B. Henry¹, L. Perraud¹, P. Quéméré¹, S. Bérard-
Bergery¹, C. Valade²
(¹Leti, ²STMicroelectronics)

13:55 – **EUV Ptycho – Ptychography Reconstruction Us-**
14:20 **ing Distributed GPUs,** U. Locans, A. Dejkameh,
Y. Ekinici, I. Mochi, R. Nebling (PSI)

14:20 – 14:50 *Coffee break*

14:50 – **Deep Learning with Broad Applications in**
15:15 **Lithography,** M. Pisarenco, S. Middlebrooks,
M. Kooiman, C. Batistakis, T. Huisman (ASML)

15:15 – **Mask Defect Assessment from SEM Images**
15:40 **Aided by Deep Learning Methods,**
P. Evanschitzky (Fraunhofer IISB)

16:00 *Special event and dinner*

Saturday, September 28

09:00 – **First Principle Based Physical Modeling of**
09:25 **Photoresists,** G. Khaira, Y. Granik, A. Drutsa,
G. Fenger, A. Kostas (Mentor Graphics)

09:25 – **Simulation Study for Organometallic**
09:50 **Resists for EUV Lithography,** Z. Belete^{1,2},
A. Erdmann^{1,2}, P. De Bisschop³, U. Welling⁴
(¹Fraunhofer IISB, ²FAU Erlangen-Nürnberg,
³imec, ⁴Synopsys)

09:50 – **Mask Simulation Impact on Wafer Pattern**
10:15 **Stochastic Patterning Predictions,** D. Dunn¹,
S. Sieg¹, L. Melvin², K. Hooker², M. Ramadan³,
M. Green³ (¹IBM, ²Synopsys, ³Photronics)

10:15 – 10:45 *Coffee break*

10:45 – **Investigating the Lithographic Effects of**
11:10 **Particles on High NA EUV Mask Pellicle,**
L. Devaraj¹, G. Bottiglieri¹, A. Erdmann²,
F. Wählich¹, M. Kupers¹, E. van Setten¹,
T. Fliervoet¹ (¹ASML, ²Fraunhofer IISB)

11:10 – **Critical Pattern Behavior at Nanometer Scale**
11:35 **Vicinity of Etched Black Border,** T. Kovalevich¹,
J. Bekaert¹, V. Wiaux¹, M.-C. Tien²,
N. Davydova³ (¹imec, ²Brion, ³ASML)

11:35 – **Introducing Etch Kernels for Efficient**
12:00 **Pattern Sampling and Etch Bias**
Prediction, F. Weisbuch, A. Lutich, J. Schatz
(Globalfoundries)

12:10 – **Final discussion and concluding remarks**
12:20

12:30 *Lunch*

