20th Fraunhofer IISB Lithography Simulation Workshop

Lithography Simulation

May 22 – 24, 2025, Gößweinstein, Germany

Program

(status as of February 11, 2025)

Thursday, May 22

12:00: Welcome and lunch

- 14:00 – 14:15: **Welcome and introduction**, Andreas Erdmann (Fraunhofer IISB)
- 14:15 – 14:40: **Physics is all you need: Self-supervised learning for inverse lithography**, Hans-Christian Ruiz (ASML)
- 14:40 – 15:05: **DNN based approaches for EUV mask inspection**, Paolo Ansuinelli, Suman Saha, Luis Felipe Barba Flores, Benjamín Béjar Haro, Yasin Ekinci, Iacopo Mochi (PSI)
- 15:05 – 15:30: **AIMS® EUV: A holistic approach to EUV mask qualification**, Matthias Roesch, Maximilian Albert, Grizelda Kersteen, Andreas Verch, Klaus Gwosch, Renzo Capelli (Zeiss SMT)

15:30 – 16:00: Coffee break

- 16:00 – 16:25: **Kinetic modeling of radical inhibition in tomographic volumetric 3D printing**, Quinten Thijssen, Antonio Jaén Ortega, Roniérik Pioli Vieira, Sandra Van Vlierberghe (Ghent University)
- 16:25 – 16:50: **Recent computational advances in tomographic volumetric additive manufacturing**, Felix Wechsler, Viola Sgarminato, Christophe Moser (EPFL, Lausanne)
- 16:50 – 17:15: **Accelerating the characterization of nanostructures through novel forward simulations and neural network approaches**, Vinh-Binh Truong[1], Analia Fernandez Herrero[1], Philipp Hönicke[2], Victor Soltwisch[2] ([1]PTB, [2]HZB)

17:30: Poster session

18:30: Dinner

- 20:00 – 20:20: **20 years Fraunhofer Simulation Workshop**
- 20:20 – 21:10 pm: **Keynote:** Patrick Naulleau (EUV Tech Inc. and Berkeley Lab)

Friday, May 23

- 9:00 – 9:25: **An eigendecomposition-free RCWA implementation for high-performance parallel computing**, Frank van der Ceelen, Yifeng Shao, Wim Coene (TU Delft)
- 9:25 – 9:50: **Rigorous electromagnetic simulation for EUV lithography and CNN reproducing electromagnetic simulations**, Hiroyoshi Tanabe, Masayuki Shimoda and Atsushi Takahashi (Institute of Science Tokyo)
- 9:50 – 10:15: **Physics-informed deep learning for 3D modeling of light diffraction from optical metasurfaces**, Vlad Medvedev (Fraunhofer IISB)

10:15 – 10:45: Coffee break

- 10:45 – 11:10: **Multiphoton absorption polymerization: Fundamentals, kinetics, and potential alternatives**, John T. Fourkas, John S. Petersen, Nicholas Fisher, Nikos Liaros, Mac Cohen, Sandra Gutierrez-Razo, Anders Dollard, and Julio Argueta (Univ. of Maryland)

- 11:10 – 11:35: **Physics-based deep learning network for inverse lithography in two-photon polymerization**, Valeriia Sedova[1], Thomas Le Deun[2], Joël Rovera[2], Jonas Wiedenmann[3], Kevin Heggarty[2], Andreas Erdmann[1] ([1]Fraunhofer IISB, [2]IMT Atlantique, [3]Heidelberg Instruments Mikrotechnik GmbH)
- 11:35 – 12:00: **A machine learning approach to structure precompensation in 3D µ-printing,** Sven Enns, Nicholas Lang, Julian Hering-Stratemeier, Georg von Freymann (RPTU Kaiserslautern, Fraunhofer ITWM)

12:00: Lunch

- 13:30 – 13:55: **EUV diffraction orders and absorber dielectric index: comparison of analytical and simulation approach,** Martin Burkhardt, Rajiv Sejpal (IBM Research)
- 13:55 – 14:20: **Mask absorber impact on local MEEF for pitch 32 nm hexagonal contact hole printing with low-n EUV masks**, Andreas Frommhold, Vicky Philipsen (imec)
- 14:20 – 14:45: **High NA Stitching: Model and OPC assessment by using low-n mask**, Dongbo Xu[1], Qinglin Zeng[1], Xuefeng Zeng[1], Werner Gillijns[2], Shibing Wang[1], Germain Fenger[1] ([1]Siemens EDA, [2]imec)
- 14:45 – 15:10: **Efficient aerial image simulations of rotated 1D patterns in anamorphic systems for lens aberration reconstruction from in-resist measurements**, Bas van Meerten, Dennis Stoel, Hilbert van Loo, Laurens de Winter (ASML)

15:30 pm: Special event and dinner

Saturday, May 24

- 9:00 – 9:25: **Modeling and characterization of EUV resists**, Takahiro Kozawa (SANKEN, Osaka University)
- 9:25 – 9:50: **Multi-trigger resists: Modeling and simulation results**, Thiago J. dos Santos[1], Andreas Erdmann[1], Alex P. G. Robinson[2,3], Alexandra McClelland[2], Carmen Popescu[2], Bernardo Oyarzún[4], Joost van Bree[4], and Mark van de Kerkhof[4] ([1]Fraunhofer IISB, [2]Irresistible Materials, [3]University of Birmingham, [4]ASML)
- 9:50 – 10:15: **Tuning resist profile and pattern variability with depth of focus and absorption**, Christoph Hauenstein[1], Bernardo Oyarzun Rivera[1], Luc van Kessel[1], Joost van Bree[1], Ruben Maas[1], Vincent Renaud[2], Tatiana Kovalevich[2], Bhavishya Chowrira[2] ([1]ASML, [2]IMEC)

10:15 – 10:45: Coffee break

- 10:45 – 11:10: **Inverse mask design for displacement Talbot lithography,** Zhixin Wang, Stefan Rietmann, Li Wang, Harun H. Solak (Eulitha)
- 11:10 – 11:35: **From physics-based optimization to augmented deep learning optimization in grayscale photolithography**, Mask Merlin Moreau, Jean-Baptiste Henry, Stéphane Bonnet (Univ. Grenoble Alpes, CEA, Leti)
- 11:35 – 12:00: **Modeling spectral behavior of grayscale lithography for broadband imaging and display**, Aamod Shanker[1,2], Arka Majumdar[1], Diogo Aguiam[2] ([1]University of Washington , [2]Iberian Nanotechnology Laboratory)
- 12:00 – 12:10: **Concluding remarks**

12:30: Lunch