HAZEM MESILHY
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Passionate engineer specializing in computational lithography, focusing on EUV mask absorber and reflective multilayer modeling. Skilled in diverse programming languages and disciplines. Committed to pushing technological boundaries and finding innovative solutions. Proven track record of exceeding project goals. Eager to contribute to groundbreaking advancements in lithography and beyond.

Work Experience

Mar. 2019 - Present Research Scientist

Fraunhofer IISB - Erlangen, Germany
- Conducted novel research in EUV lithography with a focus on mask/shadowing effects in collaboration with ASML in 5-year Joint Development Projects (JDPs)
- Improved understanding of EUV masks mechanisms, using waveguiding effects and double diffraction models
- Developed detailed physical models for EUV mask absorber, considering sidewall angles, thickness, and roughness, to optimize the lithographic processes
- Created various multilayer models and performed calibrations based on extensive literature review, exploring potential of different materials and effects of degradation
- Utilized a multi-objective genetic algorithm to identify enhancements for EUV masks, and improving understanding of underlying physics
- Actively participated in European projects, including the notable ID2PPAC, performing technical tasks, overseeing deliverables, and effectively collaborating with partners
- Mentored and supervised students, while delivering impactful presentations to customers, showcasing the capabilities of Dr.LiTHO lithography simulator
- Ensured the smooth operation of Dr.LiTHO lithography simulator by means of maintaining and updating using the Conda package manager
- Participation and presenting during Fraunhofer Lithography workshop
- Active participation in panels, SPIE Conferences, and ASML Technology Conferences

May 2017 - Feb. 2019 Research Assistant

Fraunhofer IISB - Erlangen, Germany
- Conducted research on the feasibility of Hyper-NA EUV (NA of 0.75), contributing to the development of future-generation lithography technologies
- Provided support in simulations and optimizations of EUV masks for multiple European projects, ensuring their effectiveness and reliability
- Played a key role in debugging and building the Dr.LiTHO lithography simulator, enhancing its functionality and user experience.
- Developed user-friendly installer packages for customers, facilitating the deployment and utilization of Dr.LiTHO lithography simulator
- Participation and presenting during Fraunhofer Lithography workshop

June - Sept. 2015 Programming intern

Systweak Software - Jaipur, India
- Specialized in Android development, creating engaging animations and developing widgets
- Developed a machine learning algorithm to identify and manage unused and duplicated folders
- Gained experience in DevOps and the software development cycle, collaborating with cross-functional teams to ensure efficient project delivery
- Successfully set up and managed a server and proxy server for the company, and implemented custom version of Chromium using C under Linux
- Leveraged OpenCV to create innovative filters and enhance image quality

Academic Record

2019–PRESENT Doctor of Engineering (Dr.-Ing)
FRIEDRICH ALEXANDER-UNIVERSITÄT ERLANGEN-NÜRNBERG
DISSERTATION: *Pathfinding the perfect EUV mask*

2016-2019 Master of Advanced optical Technologies
FRIEDRICH ALEXANDER-UNIVERSITÄT ERLANGEN-NÜRNBERG
- Thesis: *High NA of 0.75: A Simulation Study and multi-objective Optimization for EUV Lithography*
- Accumulative Grade : Very Good (1.5)

2016 Bachelor of Engineering in Electronics and Electrical Communication
FACULTY OF ENGINEERING - CAIRO UNIVERSITY
- Thesis: *OCR, Data handeling, and Verification of Correctness of Written Qur'an Script*
- Accumulative Grade : Very Good

Computer Skills

PROGRAMMING: Python, C++, Java, Matlab (Language Agnostic)

High-Performance Computing (HPC)

Operating Systems: Windows, Linux

Awards

- Best Student Paper Award: 2021 SPIE Photomask Technology + EUV Lithography

Skills

- Numerical Optimization: Optimization techniques, algorithms, and multiobjective optimizations

- Machine Learning: Hands-on experience and proficient in utilizing machine learning and AI tools and technologies

- Image Processing: Familiarity with OpenCV and image processing techniques

- Communication: Strong written and verbal skills for technical and non-technical audiences

- Problem-Solving: Analytical and critical thinking skills for complex problem-solving

- Teamwork: Effective collaboration in multidisciplinary team projects

Language Skills

English: Fluent   German: Intermediate   Arabic: Native

Publications

1. Qais Saadeh, **Hazem Mesilhy**, Victor Soltwisch, Andreas Erdmann, Richard Ciesielski, Leonhard Lohr, Anna Andrle, Vicky Philipsen, Devesh Thakare, Christian Laubis, Frank Scholze, Michael Kolbe, "Precise optical constants: determination and impact on metrology, simulation, and development of EUV masks," Proc. SPIE 12293, Photomask Technology 2022, 122930Y (1 December 2022) https://doi.org/10.1117/12.2643246

2. **Hazem Mesilhy**, Peter Evanschitzky, Gerardo Bottiglieri, Eelco van Setten, Claire van Lare, Tim Brunner, Mark van de Kerkhof, Andreas Erdmann, "EUV mask absorber induced best focus shifts," Proc. SPIE PC12051, Optical and EUV Nanolithography XXXV, PC1205108 (13 June 2022) https://doi.org/10.1117/12.2614174

3. Andreas Erdmann, **Hazem Mesilhy**, Peter Evanschitzky, "Attenuated phase shift masks: a wild card resolution enhancement for extreme ultraviolet lithography?," J. Micro/Nanopattern. Mats. Metro. 21(2) 020901 (11 May 2022) https://doi.org/10.1117/1.JMM.21.2.020901

4. Andreas Erdmann, **Hazem Mesilhy**, Peter Evanschitzky, Qais Saadeh, Victor Soltwisch, Simon Bihr, Jörg Zimmermann, Vicky Philipsen, "Simulation of polychromatic effects in high NA EUV lithography," Proc. SPIE11854, International Conference on Extreme Ultraviolet Lithography 2021, 1185405 (12 October 2021) https://doi.org/10.1117/12.2600931

5. **Hazem Mesilhy**, Peter Evanschitzky, Gerardo Bottiglieri, Eelco van Setten, Claire van Lare, Tim Brunner, Mark van de Kerkhof, Andreas Erdmann, "Pathfinding the perfect EUV mask: understanding the EUV mask using the hybrid mask model," Proc. SPIE 11854, International Conference on Extreme Ultraviolet Lithography 2021, 118540U (29 September 2021) https://doi.org/10.1117/12.2601243

6. L. Bilalaj, **H. Mesilhy**, A. Erdmann, "Simulation study on EUV multilayer polarization effects," Proc. SPIE 11875, Computational Optics 2021, 118750L (21 September 2021) https://doi.org/10.1117/12.2599904

7. **Hazem M. S. Mesilhy**, Peter Evanschitzky, Gerardo Bottiglieri, Claire van Lare, Eelco van Setten, Andreas Erdmann, "Investigation of waveguide modes in EUV mask absorbers," J. Micro/Nanopattern. Mats. Metro. 20(2)021004 (20 May 2021) https://doi.org/10.1117/1.JMM.20.2.021004

8. Meiyi Wu, Devesh Thakare, Jean-Francois de Marneffe, Patrick Jaenen, Laurent Souriau, Karl Opsomer, Jean Philippe Soulie, Andreas Erdmann, **Hazem M. S. Mesilhy**, Philipp Naujok, Markus Foltin, Victor Soltwisch, Qais Saadeh, Vicky Philipsen, "Study of novel EUVL mask absorber candidates," J. Micro/Nanopattern. Mats. Metro. 20(2) 021002 (3 May 2021) https://doi.org/10.1117/1.JMM.20.2.021002

9. Eelco van Setten, Katrina Rook, **Hazem Mesilhy**, Gerardo Bottiglieri, Frank Timmermans, Meng Lee, Andreas Erdmann, Tim Brunner, "Multilayer optimization for high-NA EUV mask3D suppression," Proc. SPIE 11517, Extreme Ultraviolet Lithography 2020, 115170Y (18 December 2020) https://doi.org/10.1117/12.2574450

10. Meiyi Wu, Devesh Thakare, Jean-Francois de Marneffe, Patrick Jaenen, Laurent Souriau, Karl Opsomer, Jean Philippe Soulie, Andreas Erdmann, **Hazem Mesilhy**, Philipp Naujok, Markus Foltin, Victor Soltwisch, Qais Saadeh, Vicky Philipsen, "Mask absorber for next generation EUV lithography," Proc. SPIE 11517, Extreme Ultraviolet Lithography 2020, 1151706 (20 October 2020) https://doi.org/10.1117/12.2572114

11. Andreas Erdmann, **Hazem S. Mesilhy**, Peter Evanschitzky, Vicky Philipsen, Frank J. Timmermans, Markus Bauer, "Perspectives and tradeoffs of absorber materials for high NA EUV lithography," J. Micro/Nanolith. MEMS MOEMS 19(4) 041001 (1 October 2020) https://doi.org/10.1117/1.JMM.19.4.041001

12. **H. Mesilhy**, P. Evanschitzky, G. Bottiglieri, E. van Setten, T. Fliervoet, A. Erdmann, "Pathfinding the perfect EUV mask: the role of the multilayer," Proc. SPIE 11323, Extreme Ultraviolet (EUV) Lithography XI, 1132316 (23 March 2020) https://doi.org/10.1117/12.2551870

13. Andreas Erdmann, Peter Evanschitzky, **Hazem Mesilhy**, Vicky Philipsen, Eric Hendrickx, Markus Bauer, "Attenuated phase shift mask for extreme ultraviolet: can they mitigate three-dimensional mask effects?,"J.Micro/Nanolith. MEMS MOEMS 18(1) 011005 (11 August 2018) https://doi.org/10.1117/1.JMM.18.1.011005.

14. Mohsen A Rashwan, Ali Ramadan, **Hazem M Safwat**, Salah Ashraf, Hazem Mamdouh, "Data Preparation and Handling for Written Quran Script Verification", Digital Signal Processing-Ain Shams University, Ain Shams (October 2016)
    https://doi.org/10.13140/RG.2.2.25742.87362

Conferences and reviews

- Participated in EMLC panel in EMLC 2021

- Participated in ASML Technology Conferences of 2022 and 2023

- Participated in review activities in Journal of Micro/Nanopatterning, Materials, and Metrology (JM3) ORCiD Web of Science