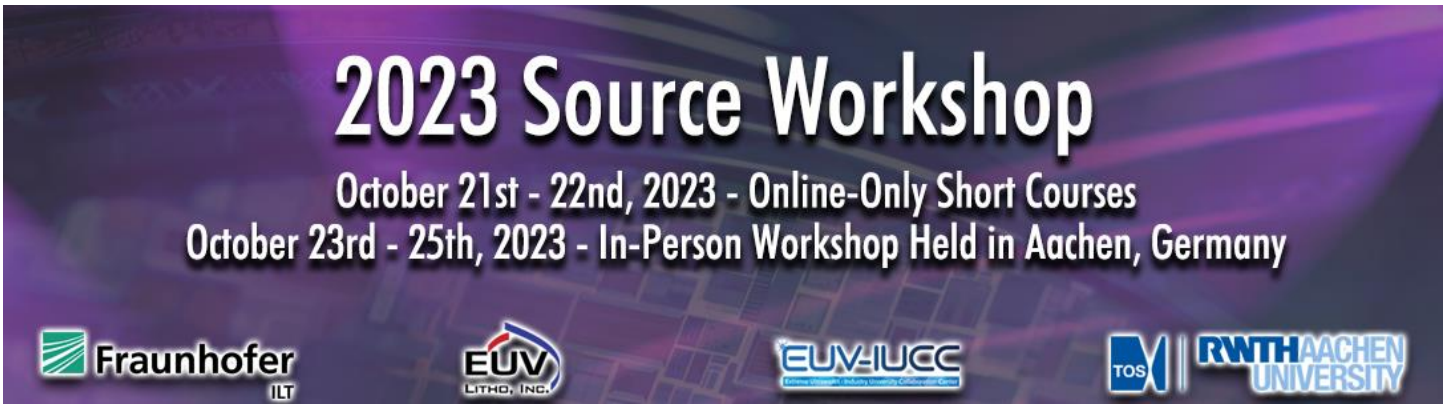

Workshop Proceedings

EUV
LITHO, INC.

Organized By:

Vivek Bakshi (EUV Litho, Inc), Chair

Sascha Brose (RWTH / ILT), Co-Chair

Jochen Vieker (Fraunhofer ILT), Co-Chair

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2023 Source Workshop Proceedings


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2023 Source Workshop

Day 1: 8:30 AM, Monday, October 23, 2023, Technologiezentrum Aachen, Aachen, Germany

Session 1: ILT / RWTH Aachen Program Showcase

Session Co-Chairs: Jochen Vieker (ILT) and Sascha Brose (RWTH - Aachen)

Digital solutions for optics and laser technology (Keynote Presentation) (S5), Carlo Holly, RWTH/ILT

Research and development of EUV sources at Fraunhofer ILT (Review Talk) (S92), Klaus Bergman, ILT

EUV technology for at-wavelength characterization tasks (S93), Sascha Brose, RWTH/ILT

High-throughput Micro-Machining Using Ultrashort Pulsed Lasers (S96), Martin Osbild, ILT

Computational optics for the design of cutting-edge optical components and systems (S94), Annika Völl, RWTH

Optical Systems for high-performance, individual (laser) applications (S95), Marcel Prochnau, RWTH

Diffractive neural networks for laser beam shaping – principle and applications (S91), Paul Buske, RWTH

Laser-based additive manufacturing of components for extreme environments (S98), Tim Lantzsch, ILT

Laser Material Deposition for Coating, Repair and Additive Manufacturing (S99), Thomas Schopphoven, ILT

Laser-Based Manufacturing of Glass Optics (S100), Manuel Jung, ILT

Session 2: Code Comparison

Session Co-Chairs: John Sheil (ARCNL /TU) and Vivek Bakshi (EUV Litho)

Code Comparison- Lessons Learned (S21), John Sheil, ARCNL

Supplier Data Presentations (S22), Yusuke Teramoto, USHIO

USHIO Sn LPP Modeling Results (S23), Akira Sasaki, QST

USHIO Sn LPP Modeling Results (Summary) (S24), Vivek Bakshi, EUV Litho

2024 Code Comparison Planning Discussions

4:30 PM, Monday, October 23, 2023, ILT, Aachen, Germany

Session 3: ILT Lab Tour and Reception

Session Co-Chairs: Jochen Vieker (ILT) and Sascha Brose (RWTH)

Lab Tour, Sascha Brose RWTH/ILT

Lab Tour, Serhiy Danylyuk, ILT

Lab Tour, Jochen Vieker, ILT

Lab Tour, Thomas Schopphoven, ILT

Lab Tour, Martin Reininghaus, ILT

Reception

Workshop Adjourned for the Day

Day 2: 9:00 AM, Tuesday, October 24, 2023, Technologiezentrum Aachen, Aachen, Germany

Session 4A: Keynote

Session Co-Chairs: Klaus Bergmann (ILT)

Trends and Perspectives of Advanced Photon Source Development (Keynote Presentation) (S1), Constantin Haefner, ILT

Plasma Dynamics and Future of LPP-EUV Source for Semiconductor Manufacturing (Keynote Presentation) (S2), Hakaru Mizoguchi, Kyushu university

Lasers and Building Blocks for Secondary Sources (Keynote Presentation) (S6), Torsten Mans, Trumpf

Session 4B: Metrology Sources,

Session Co-Chairs: Yusuke Teramoto (USHIO) and Rainer Lebert (RI)

EUV LPP light source based on fast rotating target. Target material variants and way to increase spectral brightness (Invited) (S71), Mikhail Krivokorytov, ISTEQ Group

Development of a laser-induced plasma EUV light source suitable for inspection tools (Invited) (S72), Masayasu Nishizawa, Lasertec

Optimization of an all solid-state driven Discharge Produced Plasma (DPP) EUV source (Invited) (S73), Daniel Arcaro, Energetiq

Development status of Gigaphoton's LPP EUV light source for inspection systems (Invited) (S74), Ueno Yoshifumi, GigaPhoton

Systems for development and accelerated testing of EUVL components (Invited) (S75), Jochen Vieker, Fraunhofer ILT

Characterization and performance improvement of laser- and discharge-driven EUV sources (Invited) (S76), Yusuke Teramoto, Ushio

The EUV-LAMP and application in Pellicle Inspection Tools (Invited) (S77), Andreas Biermanns-Föth, RI

Compact LPP Source for Inspection Application in Semiconductor Manufacturing (Invited) (S78), Reza Abhari, ETH Zürich

Session 5: EUV Extension and Blue- X I

Session Co-Chairs: Oscar Versolato (ARCNL) and Vivek Bakshi (EUV Litho)

EUVL Extension - Blue-X: Status and Challenges Ahead (S55), Vivek Bakshi, EUV Litho

Highly efficient generation of EUV light using 2-um drive laser light (Invited) (S52), Oscar Versolato, ARCNL

Modeling the hundreds-of-nanoseconds-long, joule-level irradiation of tin droplets with a 2 μm-wavelength laser for future EUV lithography (S53), Stan de Lange, ARCNL

Enhancement of Sn plasma EUV emission by double-sided laser illumination (S54), Yotam Mazuz-Harpaz, L2X Labs

Session 6: EUV Extension and Blue- X II

Session Co-Chairs: Marc Zimmer (Focussed Energy) and Manuel Hegelich (Tau Systems)

Roadmap to High-Brilliance EUV and SXR Sources (S46), Robert Riedel, Class 5 Photonics

Laser Driven Secondary Particle Generation: An Overview (S42), Rolf Wester, ILT

Novel opportunities of laser-driven neutron and hard X-ray sources entering the market (S44), Marc Zimmer, Focused Energy

Compact laser-accelerator driven EUV and X-ray sources (Invited) (S43), Bjorn Manuel Hegelich, Tau Systems

Session 7: Poster Session and Reception

Session Chair: Vivek Bakshi (EUV Litho)

Mitigation of polarization-dependent uncertainties in a compact EUV spectrometer (S110), Sophia Schröder, RWTH

Multi-level phase-shifting mask concept for EUV interference lithography (S111), Lars Lohmann, RWTH

Development of an ultra-compact inline transmission grating spectrograph for EUV wavelengths (S112), Sascha Brose, RWTH/ILT

Vaporization dynamics of liquid tin sheet targets (S113), Karl Schubert, ARCNL

TEUS: high-brightness EUV LPP light source based on fast rotating target. Product overview and specifications (S114), Alexander Tovstopyat, ISTEQ Group

Sinusoidal Transmission Grating Spectrometer for EUV Measurement (S115), Noa Kliss, L2X Labs

3D Printed Zoneplate Optics for Soft X-rays (S116), Eoin Byrne, UCD

Ultrabroadband EUV Inspection with High-harmonic Generation Sources (S117), Martin Wünsche, Indigo Optical Systems GmbH and Friedrich Schiller University Jena

Workshop Adjourn for the day

Day 3: 9:00 AM, Wednesday, October 25, 2023, Technologiezentrum Aachen, Aachen, Germany

Session 8A: Keynote Presentations

Session Chair: Oscar Versolato (ARCNL)

Resolving and improving the interfaces of Short-wavelength Multilayers – EUV and beyond (Keynote) (S4), Marcelo Ackerman, UTwente

Scaling laws of source requirements for optical inspection in semiconductor device manufacturing (Keynote) (S3), Larissa Juschkin, KLA

Session 8B: Laser, HHG and Applications

Session Co - Chairs: Sascha Brose (RWTH - Aachen) and Jochen Vieker (ILT)

Coherent EUV Metrology Based on High Harmonic Generation (S45), Travis Frazer, KM Labs

High Flux XUV Beamlines for Imaging and Spectroscopy (S48), Sven Breitkopf, AFS (Trumpf)

Fabrication of (complex) periodic patterns by Talbot lithography with compact EUV sources (S47), Bernhard Lüttgenau, RWTH

VUV frequency comb for 229-Thorium isomer excitation (S41), Stephan Hermann Wissenberg, ILT

High performance high harmonic sources, imaging and metrology in the EUV (S49), Jan Rothhardt, IOF

Session 9: HVM Sources

Session Co-Chairs (HVM Sources): Mark van de Kerkhoff (ASML) and Job Beckers (TUE)

EUV-induced Plasma in Lithographic Scanner (Invited) (S61), Seth Brussaard, ASML

EUV-induced plasma as an intermediate state for EUV beam metrology (Invited) (S62), Job Beckers, TUE

Investigations of EUV-induced low density hydrogen plasma in a high-intensity irradiation setup (S63), Adelind Elshani, RWTH

Toward a direct comparison of measured and modeled EUV Spectra (Invited) (S64), Yiming Pan, Hokudai University

Acceleration of Energetic Ions in Laser-Driven Tin Plasma EUV Sources (Invited) (S65), Samuel Totorica, Princeton University

High-Resolution Spectroscopic Imaging of Atoms and Nanoparticles in Thin Film Vaporization (S66), Dion Engels, ARCNL

Session 10: Optics and Metrology

Session Co-Chairs: Torsten Feigl (optiXfab) and Frank Scholze (PTB)

EUV collector mirrors for high-power LPP sources (Invited) (S84), Torsten Feigl, optiXfab

Optical constant determination in the vacuum ultraviolet and EUV spectral ranges based on s- and p-polarized reflectance measurements (Invited) (S85), Frank Scholze, PTB

Spectral characterization of EUV source at TNO (Invited) (S83), Jacqueline Veldhoven, TNO

Lab-based EUV spectroscopy: A guide from data acquisition to reconstructed sample parameters (S86), Sven Glabisch, RWTH

Simultaneous spectroscopy and imaging of an EUV plasma using zone-plates dispersion matched to transmission gratings (Invited) (S82), Muharrem Bayraktar, University of Twente

Light Sources for Metrology Applications (Invited) (S81), Iris Pilch, Zeiss

Workshop Adjourned.


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