

TECHNICAL PROGRAM | EXHIBITION GUIDE

SPIE. PHOTOMASK TECHNOLOGY + EUV LITHOGRAPHY

29 SEPTEMBER-3 OCTOBER 2024 | MONTEREY CONFERENCE CENTER
MONTEREY, CALIFORNIA, USA



SPIE. PHOTOMASK TECHNOLOGY + EUV LITHOGRAPHY

The premier technical meeting for photomasks, patterning, metrology, materials, inspection/repair, mask business, extreme ultraviolet lithography, and emerging technologies.

Conferences: 29 September–3 October 2024

Exhibition: 1–2 October 2024

Monterey Conference Center
Monterey, California, USA

spie.org/puv

#SPIEPhotomaskEUV



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PHOTOMASK TECHNOLOGY CHAIRS



Seong-Sue Kim
Seoul National Univ.
(Republic of Korea)
Conference Chair



Conference Chair
Lawrence S. Melvin
Synopsys, Inc. (USA)
Conference Co-Chair

EXTREME ULTRAVIOLET LITHOGRAPHY CHAIRS



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imec (Belgium)
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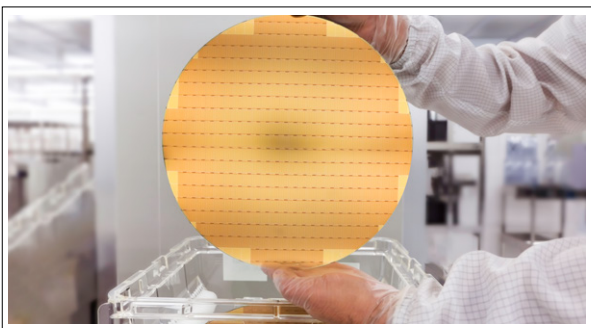


Eric Hendrickx
imec (Belgium)
Conference Co-Chair



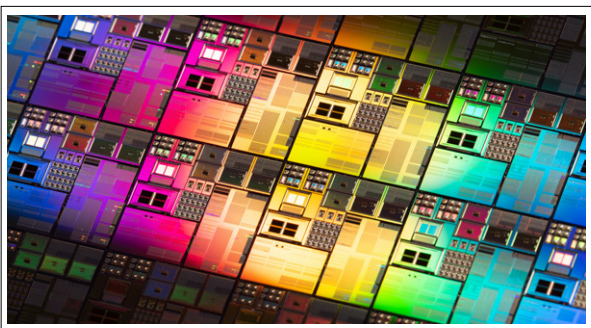
Experience the energy of SPIE Photomask Technology + EUV Lithography

Get ready to enjoy engaging conversations, hear the latest breakthroughs, and make important connections in person. Hear cutting-edge research on photomasks, patterning, metrology, materials, inspection/repair, mask business, extreme ultraviolet lithography, emerging technologies, and more. Attend technical presentations, the free exhibition, plenary presentations, and a variety of networking activities.



PHOTOMASK TECHNOLOGY—PAGES 9-19

Addressing key topics related to photomasks.



EXTREME ULTRAVIOLET LITHOGRAPHY—PAGES 9-19

Addressing the worldwide status of EUV technology and infrastructure readiness.

Plenary Sessions—PAGES 4-5

Presentations by leading speakers sharing their latest developments, industry insights, and visions for the future.

Technical and Networking Events—PAGE 6-7

Poster sessions, panel discussion, and networking with a technical focus.

EXHIBITION—PAGES 20-23

The free exhibition will run 1-2 October 2024. The premier exhibition for mask makers, EUVL, emerging technologies, and mask business. Connect with top suppliers showcasing the newest products, innovations, and latest technologies.

Facility Map—PAGE 2

General Information—PAGE 2-3

SPIE Policies—PAGE 28-29

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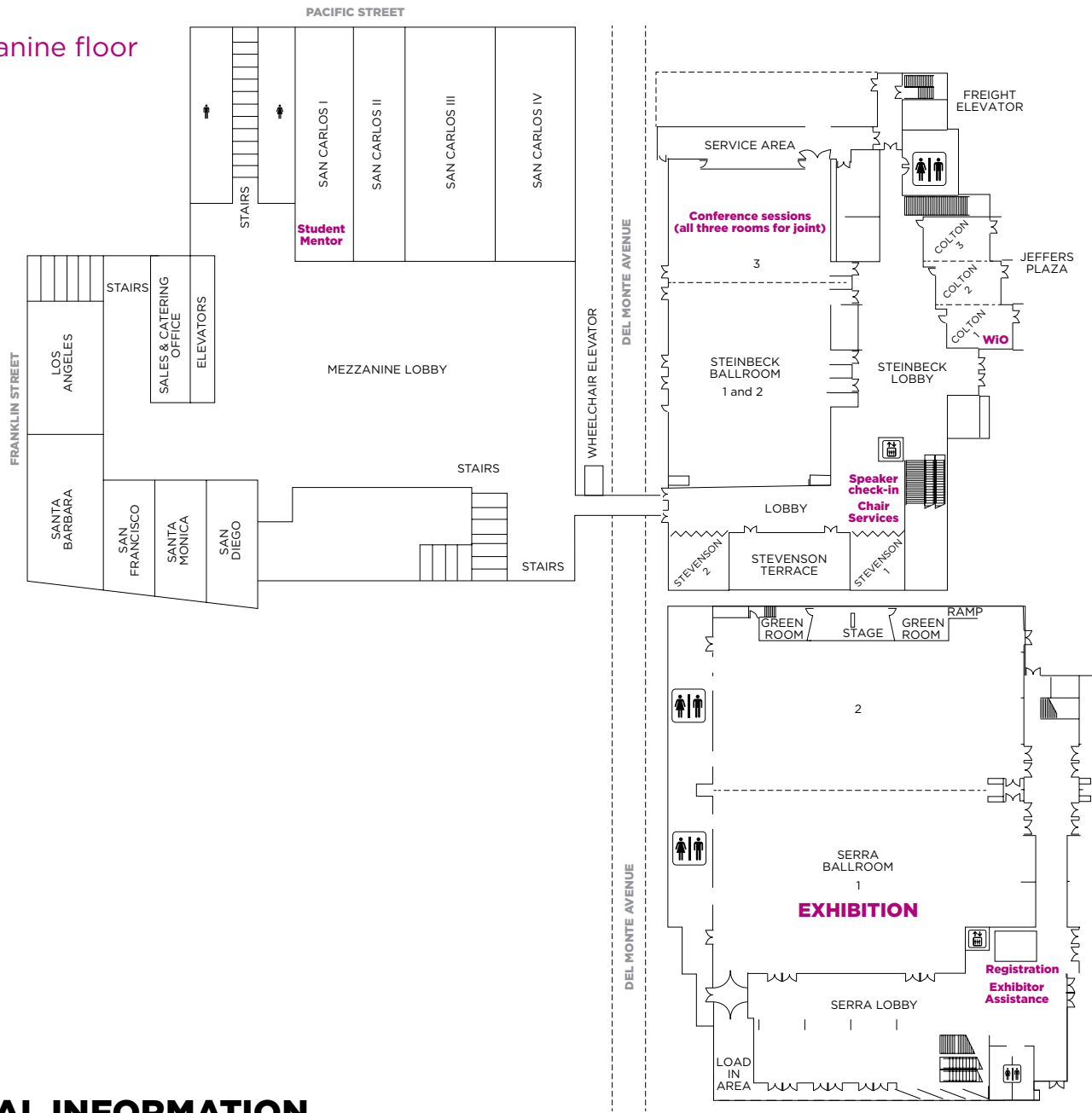
50 proceedings downloads

The SPIE Photomask Technology + EUV Lithography conference proceedings papers and presentations are published in the SPIE Digital Library. All paid conference registrations include 50 downloads for ongoing access.

See full details and updates at spie.org/puv or on the SPIE App

MONTEREY CONFERENCE CENTER

Mezzanine floor



GENERAL INFORMATION

Badge pick up and registration hours

Monterey Conference Center
Serra Lobby

Sunday 29 September	12:00 PM-6:00 PM
Monday 30 September	7:30 AM-4:00 PM
Tuesday 1 October	7:30 AM-4:00 PM
Wednesday 2 October	8:00 AM-4:00 PM
Thursday 3 October*	8:00 AM-11:00 AM

*Thursday is conference registration only

SPIE Cashier

Monterey Conference Center, Serra Lobby

Registration payments

If you are planning to register onsite, please do so at the "Need to Register" laptop station. Your credit card payment will be processed during registration.

If you wish to pay with cash or check, you will be directed to the Cashier once you have completed registration for final payment.

If you have already registered and wish to purchase a guest admission ticket to the SPIE Gala, you may do this online by signing into your SPIE account.

Receipt and Certificate of Participation

Preregistered attendees who need an SPIE-stamped receipt or attendees who need a Certificate of Participation may obtain those at the Cashier.

Badge Corrections

Badge corrections can be made at the Cashier. Please mark your badge with your changes before approaching the counter.

Speaker check-in

Monterey Conference Center
Steinbeck Lobby

Sunday 29 September	3:00 PM-6:00 PM
Monday 30 September	7:30 AM-4:00 PM
Tuesday 1 October	7:30 AM-4:00 PM
Wednesday 2 October	7:30 AM-4:00 PM
Thursday 3 October	7:30 AM-11:00 AM

*Thursday is conference registration only

All speakers must stop at Speaker Check-In to upload their slide presentation files at least two hours before their scheduled session or the day before if presenting in the first session.

Speakers are not able to present using their own devices. All conference rooms are equipped with a laptop, projector, screen, lapel microphone, and laser pointer.

SPIE will record the audio plus screen content of all presentations. Recordings will be published on the SPIE Digital Library approximately six weeks after the event.

Poster set up

Monterey Marriott, San Carlos III/IV

Poster session details:

Monday 30 September	6:00 PM - 7:30 PM
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Poster setup is between 2:30 PM - 6:00 PM.

<https://spie.org/PUV/poster-presentation-guidelines>

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Business Center

Monterey Marriott

Attendees may use their Monterey Marriott hotel room key to access the onsite Business Center, which offers use of free online computers and printers. Copy and fax machines are available at the front desk.

Internet Access

At the Monterey Conference Center, SPIE provides complimentary wireless access.

Network: SPIEPUV24

Password: SPIE2024

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SPIE Conference App information

Search and browse the program, special events, participants, exhibitors, and more. Build your personalized schedule and sync with the online MySchedule tool. Free Conference App available for iPhone and Android phones. Information about restaurants and food options is also available on the App.

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Lost and found

Found items will be kept at the SPIE Cashier during registration hours each day and then turned over at the end of the day to the Monterey Conference Center (831-646-3770) or the Monterey Marriott (831-649-4234) depending on the location where they were found.

Childcare services

Art on Wheels Creative Childcare and Events

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Nicole Rappa Macauley

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www.artonwheelsmontereykids.com

Note: SPIE does not imply an endorsement or recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

Food and beverage services

Complimentary coffee will be available during registration hours from Monday through Thursday at the Monterey Conference Center.

Complimentary Breakfast Breads

Monday-Thursday	Monterey Conference Center, Steinbeck Lobby	7:30AM - 8:30 AM
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Coffee Breaks – Complimentary coffee

Monday	Monterey Conference Center, Steinbeck Lobby	7:30 AM - 4:00 PM
Tuesday	Monterey Conference Center, Steinbeck Lobby	7:30 AM - 9:30 AM
	Monterey Conference Center, Exhibition Hall, Serra Ballroom	10:00 AM - 4:00 PM
Wednesday	Monterey Conference Center, Steinbeck Lobby	7:30 AM - 9:00 AM
	Monterey Conference Center, Exhibition Hall, Serra Ballroom	9:30 AM - 4:00 PM
Thursday	Monterey Conference Center, Steinbeck Lobby	7:30 AM - 11:00 AM

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SPIE hosted lunches

Monterey Marriott, San Carlos Ballroom

All paid conference attendee registration includes complimentary lunch Monday through Wednesday.

Monday	Monterey Marriott, San Carlos Ballroom	12:00 PM- 1:00 PM
Tuesday	Monterey Conference Center, Exhibition Hall, Serra Ballroom	12:00 PM- 1:00 PM
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Seeing beyond		
Wednesday	Monterey Conference Center, Exhibition Hall, Serra Ballroom	12:00 PM- 1:00 PM
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Monterey Restaurants

See a list of area restaurants, with hours

<https://www.seemonterey.com/food-wine/restaurants/>

PLENARY SESSIONS

Hear from world-class speakers on the industry's challenges and breakthroughs.

Open to all paid conference attendees.



Monday All-Symposium Plenary

30 September 2024 • 8:00 AM - 9:40 AM | Monterey Conf. Ctr., Steinbeck 2

PLENARY PRESENTATIONS
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Session Chairs: **Seong-Sue Kim**, Seoul National Univ. (Republic of Korea) and **Kurt G. Ronse**, imec (Belgium)

8:00 AM to 8:20 AM:

Announcements and Welcome

8:20 AM to 9:00 AM:

Scaling EUV lithography to support Moore's Law through the AI era



Christophe Fouquet
ASML Netherlands B.V. (Netherlands)

Strong trends drive the semiconductor industry: ubiquitous computing, the energy transformation and artificial intelligence, to name just a few, have the potential to propel the industry towards \$1 trillion of sales by 2030. Enabling this trajectory is the extension of Moore's Law through innovation in semiconductor devices, materials, manufacturing technologies and 3D integration. Moore's Law, today, is best understood as scaling system energy-efficient performance.

To enable chip makers in their pursuit of more powerful, smaller, cheaper, more integrated and more energy-efficient chips, ASML focuses on driving a holistic lithography roadmap with innovation across the entire product and service portfolio. At the core of it is EUV lithography technology. EUV is now mature, and the roadmap offers further improvements in imaging performance, accuracy and productivity, as well as a major reduction in cost per wafer.

ASML has shipped the first High NA EUV systems and is enabling customers to run R&D wafers in its High NA lab in Veldhoven, the Netherlands. The new High NA optics, combined with progress on the EUV source, provide the foundation for the future of EUV in the form of a common platform, capable of carrying 0.33 NA, 0.55 NA and 0.75 NA and providing a significant cost reduction opportunity. ASML is committed to push technology to new limits, partnering with all members of our ecosystem, to enable chip makers to realize their ambitions.

9:00 AM - 9:40 AM:

Exposure tool and ecosystem status for 0.55NA EUV lithography



Mark Phillips
Intel Corp. (USA)

The first 0.55NA extreme ultraviolet lithography tools continue to progress towards production without the delays and technology gaps seen with the introduction of 0.33NA EUVL. Carry-over of proven modules and technologies from 0.33NA is providing the expected benefits in predictability and schedule, while the resources concentrated on the innovative anamorphic optics have delivered system-level aberrations and resist imaging performance consistent with the design and planned application of the tools. At the same time, the healthy ecosystem sustained by heavy usage of 0.33NA EUVL in high-volume manufacturing has supported the incremental enhancements in masks, resist, underlayers, etching, inspection, and metrology needed to insert 0.55NA EUVL on the Intel 14A process node. Introduction at this node avoids the need for excessive multi-patterning with 0.33NA EUV, and is particularly beneficial when front-side metal pitches are co-optimized with backside power delivery. With the ecosystem for initial introduction in place, we are already working on enhancements such as a 6x12 mask format to extract the full productivity potential from the High NA platform while simplifying design by eliminating the need to consider die-stitching locations in floor plans for large die. Finally, there is growing optimism that numerical apertures significantly beyond 0.55NA are technically feasible, though work continues to make the business case to justify development of "hyperNA" production tools.

Wednesday All-Symposium Plenary

2 October 2024 • 8:10 AM - 9:30 AM | Monterey Conf. Ctr., Steinbeck 2

Session Chairs: **Geert Vandenberghe**, imec (Belgium) and **Lawrence S. Melvin**, Synopsys, Inc. (USA)

8:10 AM to 8:50 AM:

From 'system on a chip' to 'system of chips': Hyperconvergence in design and manufacturing



Srinivas Raghvendra
Synopsys, Inc.
(USA)

'Systems of chips' such as 3D ICs and HBMs are already being widely applied in industry sectors such as high-performance computing, mobile, and automotive. The design of such chips has required a 'hyperconvergence' of various design and multiphysics disciplines. To fabricate such chips efficiently, we are also beginning to see increased convergence of design, multiphysics, and manufacturing technologies. And AI technologies have proliferated widely in design and manufacturing solutions, helping accelerate the availability of AI platforms, setting up a virtuous cycle of AI helping AI. In this talk, I will survey the state of the industry on these fronts and share some suggestions to accelerate this convergence.

8:50 AM to 9:30 AM:

EUV mask technologies: Evolution and ecosystem for devices



Jin Choi
SAMSUNG Electronics Co., Ltd.
(Republic of Korea)

For the innovation of DRAM and Logic semiconductors, EUV Lithography and Mask technology have played a crucial role. In this paper, we will specifically examine the evolution of Mask technology for the development of devices and discuss the development of the ecosystem.

PLENARY PRESENTATIONS
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SPECIAL EVENTS

TECHNICAL EVENTS

In-depth discussions, workshops, and networking with a technical focus

Open to all paid conference attendees.

2nd Annual Workshop on Large EUV Mask Format

29 September 2024 • 1:30 PM - 5:30 PM
Monterey Conf. Ctr., Steinbeck 3

Attend this year's workshop on Large EUV Mask Format where we encourage representatives from companies and institutions of suppliers, users, and stakeholders to provide quick updates on recent progress and/or future plans. We will address high-NA EUV productivity improvement, give a key requirement summary on the "6x12" large reticle by ASML, provide a device manufacturers' update, and discuss SEMI Standards, blank manufacturing processes, infra structure on reticle pod, load port, etc., and all mask process tools.



Poster Session

30 September 2024 • 6:00 PM - 7:30 PM
Monterey Marriott, San Carlos IV

Symposium attendees are invited to attend the Poster Session on Monday evening. This session provides an opportunity for attendees to meet with colleagues, network, view posters and interact with the authors. Attendees are requested to wear their conference registration badges.

Poster setup is between 2:00 PM and 6:00 PM.

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All-Symposium Panel

2 October 2024 • 4:00 PM - 5:45 PM
Monterey Conf. Ctr., Steinbeck Ballroom

Join us for an exciting panel discussion on early high-NA EUV learning and the presentation of the BACUS awards.

4:00 PM - 5:30 PM

Panel discussion: Early high-NA EUV learning and the implications for the future of EUV lithography

Moderator: **Harry Levinson**, HJL Lithography (USA)

Panelists:

Mark Phillips, Intel Corp. (USA)

Chris Mack, Fractilia (USA)

Tom Cecil, Synopsys (USA)

Vicky Philipsen, imec (Belgium)

Jason Stowers, Inpria Corp. (USA)

Seongbo Shim, SAMSUNG Electronics Co., Ltd. (Republic of Korea)

High-NA EUV lithography brings the potential for continued lithographic scaling. These advances come with complications, including anamorphic patterning, stitching, and new mask materials. Early learning about many high-NA topics is arriving with the first tools under testing. How does the information learned in early high-NA development compare to predictions? What does early high-NA learning teach about developing hyper-NA lithography?

Awards 5:30-5:45 PM

Please join us for the presentation of the 2024 BACUS awards and scholarship.

NETWORKING EVENTS

These sessions give you the opportunity to network, learn, and discuss with like-minded professionals from around the world.

Student-Mentor Luncheon

30 September 2024 • 12:00 PM - 1:00 PM
Monterey Marriott, San Carlos I

All students attending the conference are invited to join industry experts at a separate lunch hosted by Vicky Philipsen of imec. You can choose to be paired with an experienced mentor. An explanation of the mentoring initiative will be followed by table discussions, lunch, and time to connect with your mentor.



Vicky Philipsen
imec (Belgium)

Dessert Break

1 October 2024 • 3:00 PM - 3:45 PM
Monterey Conf. Ctr., Serra Ballroom

Join Exhibitors and Conference attendees together for an afternoon coffee break and dessert session to provide a pick-me-up experience in the Exhibition Hall.

Women in Optics Networking Lunch

2 October 2024 • 12:00 PM - 1:00 PM
Monterey Conf. Ctr., Colton

Join other women in the field for informal discussions and networking during a special Wednesday lunch hosted by Anuja DeSilva of Lam Research.



Anuja DeSilva
Lam Research (USA)

Dessert break

2 October 2024 • 3:00 PM - 3:45 PM
Monterey Conf. Ctr., Serra Ballroom

Join Exhibitors and Conference attendees together for an afternoon coffee break and dessert session to provide a pick-me-up experience in the Exhibition Hall.



Gala at the Portola Hotel and Spa

2 October 2024 • 6:15 PM - 9:00 PM
Portola Hotel, Club Room and Beer Garden

All paid attendees are welcome to participate in this gala dinner hosted at the Portola Hotel and Spa. Badges are required. Gala tickets for additional guests may be purchased for \$125 USD during registration or onsite through the cashier.

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Seeing beyond



TECHNICAL CONFERENCE SCHEDULE

TIME	CONFERENCE 13215 LOCATION: MONTEREY CONF. CTR., STEINBECK 3 Monday–Thursday 30 September–3 October 2024 Proceedings of SPIE Vol. 13215 International Conference on Extreme Ultraviolet Lithography 2024	CONFERENCE 13216 LOCATION: MONTEREY CONF. CTR., STEINBECK 2 Monday–Thursday 30 September–3 October 2024 Proceedings of SPIE Vol. 132161 Photomask Technology 2024
	MONDAY 30 SEPTEMBER	
8:00 - 9:40 AM LOCATION: STEINBECK BALLROOM	Welcome and Monday All-Symposium Plenary Session Chairs: Seong-Sue Kim , Seoul National Univ. (Republic of Korea); Kurt G. Ronse , imec (Belgium)) Announcements and Welcome Scaling EUV lithography to support Moore’s Law through the AI era (Plenary Presentation), Christophe Fouquet , ASML Netherlands B.V. (Netherlands) Exposure tool and ecosystem status for 0.55NA EUV lithography (Plenary Presentation), Mark C. Phillips , Intel Corp. (USA)	
STEINBECK LOBBY	Coffee Break • 9:40 AM - 10:10 AM	
MORNING 10:10 AM - 12:10 PM LOCATION: STEINBECK BALLROOM	SESSION 1 • JOINT SESSION WITH PHOTOMASK AND EUVL: PROSPECTS OF CURRENT AND FUTURE EUVL Session Chairs: Patrick P. Naulleau , The Ctr. for X-Ray Optics (USA), Akiyoshi Suzuki , AS Lithography Consulting (Japan) 13215-1 • INVITED PAPER Advancing EUV Lithography Optics supporting current roadmap and beyond , Olaf Conradi, Paul Gräupner, Peter Kuerz, Wolfgang Seitz, Carl Zeiss SMT GmbH (Germany); Jan van Schoot, Roel Moors, ASML Netherlands B.V. (Netherlands) 13215-2 • INVITED PAPER 0.33 NA EUV Systems for High-Volume Manufacturing , Peter Klomp, ASML Netherlands B.V. (Netherlands) 13215-3 • High resolution lithography: Latest generation in EUV lithograph with 0.55 NA , Aysegul Cumurcu, Cheuk-Wah Man, Bas van Meerten, Hilbert Van Loo, Eelco van Setten, Stefan Smith-Meerman, Gokay Yegen, Diederik de Bruin, Jan van Schoot, Rudy Peeters, Kaustuve Bhattacharyya, Greet Storms, Peter Vanoppen, ASML Netherlands B.V. (Netherlands) 13216-119 • INVITED PAPER Logic and memory patterning breakthrough in the imec ASML High-NA lab , Victor M. Blanco Carballo, Syamashree Roy, Bhavishya Chowrira, Van Tuong Pham, Johan Wouters, Shubhankar Das, Philippe Leray, Ru-Gun Liu, Kurt Ronse, Geert Vandenberghe, Ardavan Niroomand, Philippe Foubert, Vito Daniele Rutigliani, Hyo Seon Suh, Mihir Gupta, Danilo De Simone, Mircea Dusa, Christophe Beral, Vicky Philippen, Vincent Wiaux, Joern Holger Franke, Joost Bekaert, Balakumar Baskaran, Werner Gilljins, Ryoung han Kim, Yasser Sherazi, Hemant Vats, Miroslav Cupak, Carol Chang, Yun-Jing Lin, Jeonghoon Lee, Soobin Hwang, Kiho Yang, Kenichi Miyaguchi, imec (Belgium) 13216-2 • INVITED PAPER First High-NA APMI and AIMS EUV Measurements on Anamorphic High-NA Masks , Safak Sayan, Arvind Sundaramurthy, Ted Liang, Yuwei Li, Kiarash A. Zamani, Ruihong Zhang, Nathan Wilcox, Sven Henrichs, Steve L. Carson, Frank E. Abboud, Intel Corp. (USA) 13216-3 • INVITED PAPER Towards a 1000W-compatible EUV Pellicle , Mark A. van de Kerkhof, ASML Netherlands B.V. (Netherlands)	
LOCATION: MARRIOTT, SAN CARLOS IV	Lunch Break • 12:10 PM - 1:40 PM	
AFTERNOON	SESSION 2 • 1:45 PM - 3:20 PM Resist Session Chairs: Toru Fujimori , FUJIFILM Corp. (Japan), Anuja De Silva , Lam Research Corp. (USA) 13215-4 • INVITED PAPER Advancements in dry resist patterning towards high NA EUV enablement , Ali Haider, Mohand Brouri, Francesco Gullo, Zhengtao Chen, Benjamin Kam, Anuja De Silva, Lam Research Belgium BV (Belgium); Yongliang Dong, Rich Wise, Lam Research Corp. (USA); Matteo Beggiato, Christophe Beral, Hyo Seon Suh, Danilo De Simone, imec (Belgium) 13215-87 • INVITED PAPER Enhancing sustainability in semiconductor manufacturing: Energy-efficient optical crosslinking for lithography processes , Elke Caron, Wesley Zanders, Seungjoo Baek, Andreia Santos, SCREEN SPE Germany GmbH (Germany); Seonggil Heo, Jelle Vandereyken, Hyo Seon Suh, imec (Belgium); Douglas J. Guerrero, Brewer Science, Inc. (USA); Masahiko Harumoto, Tsuyoshi Mitsuhashi, SCREEN Semiconductor Solutions Co., Ltd. (Japan) 13215-6 • A dry development process for vertically tailored hybrid multilayer EUV photoresist: Chemical Vapor Development (CVD) , Ji-Hoo Seok, Jiwon Kim, Hyeonseok Ji, Jaehyuk Lee, Hanyang Univ. (Republic of Korea); Kwangsub Yoon, Hanyang Univ. (Republic of Korea), SAMSUNG Electronics Co., Ltd. (Republic of Korea); Myung Mo Sung, Jinho Ahn, Hanyang Univ. (Republic of Korea)	SESSION 2 • 1:40 PM - 3:30 PM Blank and Etch Session Chairs: Takahiro Onoue , HOYA Corp. (Japan), Bryan S. Kasprovicz, HOYA Corp. USA (USA) 13216-4 • INVITED PAPER Etching approaches for next generation EUV photomask materials , Jeff Chen, Rebecca Stern, Rao Yalamanchili, Applied Materials, Inc. (USA); Yohei Ikebe, Takahiro Onoue, Bryan Kasprovicz, HOYA Corp. (Japan) 13216-6 • Atomic layer etching process application to TaO hard-mask etching for next-generation EUV (Extreme-Ultraviolet) photomask fabrication , Naoki Inoue, Junji Sano, Takuo Kikuchi, Toshiba Corp. (Japan); Yoshie Okamoto, Kazuki Nakazawa, Takashi Miyamoto, Yoshinori Iino, Tomoaki Yoshimori, Masashi Yamage, Sadayuki Jimbo, Shibaura Mechatronics Corp. (Japan) 13216-98 • Next generation reticle substrate for EUV lithography , Michael J. Campion, Carlos A. Durán, John E. Maxon, Ali Mohammadkhal, Corning Incorporated (USA)

TECHNICAL CONFERENCE SCHEDULE

TIME	CONFERENCE 13215 LOCATION: MONTEREY CONF. CTR., STEINBECK 3 Monday–Thursday 30 September–3 October 2024 Proceedings of SPIE Vol. 13215 International Conference on Extreme Ultraviolet Lithography 2024	CONFERENCE 13216 LOCATION: MONTEREY CONF. CTR., STEINBECK 2 Monday–Thursday 30 September–3 October 2024 Proceedings of SPIE Vol. 132161 Photomask Technology 2024
AFTERNOON	SESSION 2 (CONTINUED) • 1:45 PM - 3:20 PM 13215-7 • EUV CAR-NTD with new developer for stochastic reduction , Toru Fujimori, Keiyu Ou, Nishiki Fujimaki, Naohiro Tango, FUJIFILM Corp. (Japan) 13215-8 • k1-factor and stochasticity in EUV lithography: from the perspective of correlated multi-photon processes and molecular clustering , Hiroshi Fukuda, Hitachi High-Tech Corp. (Japan) 13215-9 • Study of a positive and negative tone organometal chemically amplified resist for high resolution EUV single patterning , Satoshi Enomoto, Kohei Machida, Shunya Honda, Toyo Gosei Co., Ltd. (Japan); Akihiro Konda, Eich Nomura, Takahiro Kozawa, Osaka Univ. (Japan)	SESSION 2 (CONTINUED) • 1:40 PM - 3:30 PM 13216-7 • Effective medium approximation for EUV multilayer intermixing , Seulki Roh, Taewon Go, Chungik Oh, Hanjune Yoon, Hakseung Han, Sanghee Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea) 13216-8 • Lithographic imaging analysis of new EUV mask blank materials and their architectures , Supriya L. Jaiswal, Astrileux Corp. (USA); Andrew Dawes, Synopsys, Inc. (USA) 13216-9 • Low-n absorber EUV masks: Mask manufacturing assessment through process characterization and optimization with early look at EUV Low NA and High NA imaging performance , Henry H. Kamberian, Photronics, Inc. (USA); Jed Rankin, IBM Thomas J. Watson Research Ctr. (USA); Jinju Beineke, Photronics, Inc. (USA); Romain Lallement, IBM Thomas J. Watson Research Ctr. (USA); Michael Green, Photronics, Inc. (USA); Martin Burkhardt, IBM Thomas J. Watson Research Ctr. (USA); Mohamed Ramadan, Photronics, Inc. (USA); Scott Halle, Rajiv Sejpal, Oseo Park, Sriharsha Sudhindra, IBM Thomas J. Watson Research Ctr. (USA); Chris Proglar, Photronics, Inc. (USA) 13216-10 • AI/ML manufacturing applications for optical precision and zero defect EUV mask blanks , Ibrahim Burki, Zaw Win Phy, HOYA Electronics Singapore Pte. Ltd. (Singapore)
STEINBECK LOBBY	Coffee Break	
	SESSION 3 • 3:50 PM - 5:30 PM Computational Lithography Session Chairs: Frank E. Abboud , Intel Corp. (USA), Jörg Zimmermann , Carl Zeiss SMT GmbH (Germany) 13215-10 • INVITED PAPER Increasing throughput in EUV logic applications with thinner low-n masks and wavefront optimization , Nick Pellens, Vicky Philipsen, Joern-Holger Franke, Kurt Ronse, Eric Hendrickx, imec (Belgium) 13215-11 • INVITED PAPER Nanometer-to-millimeter scale computational lithography for the study, detection, classification, repair and reduction of stochastic defects in EUVL , John J. Biafore, KLA Corp. (USA) 13215-12 • Benefits of using advanced sub-resolution features for 0.55NA brightfield imaging , Parul Dhagat, Sofia Leitao, Nadia D. Rivera Torres, Guido Schiffelers, ASML Netherlands B.V. (Netherlands); David Rio, ASML Belgium (Belgium); Cyrus Tabery, ASML US, Inc. (USA) 13215-13 • OPC and Modeling Solution to Support 0.55NA EUV Stitching , Xuefeng Zeng, Qinglin Zeng, Siemens EDA (USA); Dongbo Xu, Siemens EDA (Belgium); Werner Gillijns, imec (Belgium); Edita Tejnli, Yuyang Sun, Germain Fenger, Siemens EDA (USA) 13215-14 • High NA Stitching: how to evaluate performance? , Natalia V. Davydova, ASML Netherlands B.V. (Netherlands); Vincent Wiaux, imec (Belgium); Cyrus Tabery, ASML (USA); Lieve van Look, Joost Bekaert, Tatiana Kovalevich, imec (Belgium); Adam Lyons, ASML (USA); Airat Galiullin, ASML Netherlands B.V. (Netherlands); Ataklti Weldeslassie, Nick Pellens, imec (Belgium); Bram Slachter, ASML Netherlands B.V. (Netherlands) 13215-15 • Pattern selection strategy via clustering for logic EPE monitoring , Roy Anunciado, Konstantin Nechaev, Reza Sahraeian, ASML Netherlands B.V. (Netherlands); Guillaume Schelcher, Shubhankar Das, imec (Belgium); Stefan van der Sanden, Harm Dillen, ASML Netherlands B.V. (Netherlands)	SESSION 3 • 4:00 PM - 6:00 PM Mask Patterning Session Chairs: Ingo Bork , Siemens EDA (USA), Dong-Seok Nam , ASML (USA) 13216-11 • Requirements and strategies of high-NA EUV mask using MBMW , Yoonjung Cho, Inhwon Noh, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Jongmun Park, Byungsup Ahn, Changyoung Jeong, Jin Choi, Sang-Hee Lee, SAMSUNG Electronics Co. (Republic of Korea) 13216-12 • New applications on multi-beam mask writers to enable mask making in 3nm and beyond , Ta Wei Ou, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Jeremy L.C. Lu, Alan C.L. Chen, Taiwan Semiconductor Manufacturing Co. (Taiwan); Alexander Egl, IMS Nanofabrication GmbH (Austria); IMS Nanofabrication GmbH (Austria); Matthias Kühmayer, IMS Nanofabrication GmbH (Austria) 13216-13 • Comparative study of bulk-sleeve dose split for curvilinear mask shapes , Ingo Bork, Siemens EDA (USA); Nageswara Rao, Rachit Sharma, Kushlendra Mishra, Siemens EDA (India) 13216-15 • Mask performance improvement by Pixel Level Dose Correction , Mayuko Matsumoto, Naoki Yoshida, Tetsunori Hirata, Makoto Motegi, Kiyoshi Kageyama, Mitsuharu Yamana, Toppan Photomask Co., Ltd. (Japan); Wataru Kunishima, Ryo Iikubo, NuFlare Technology, Inc. (Japan) 13216-16 • Unfolding the curves: novel designs and metrology methods for curvilinear masks qualification , Darko Trivkovic, Chieh-Miao Chang, Jiahui Wang, Yi-Pei Tsai, Xuelong Shi, Joost Bekaert, Kenichi Miyaguchi, imec (Belgium) 13216-40 • Translating e-beam-litho performance to optical specifications , Ulf Weidenmueller, Eike Linn, Stefan Fasold, Ines Stolberg, Vistec Electron Beam GmbH (Germany) 13216-17 • PEC parameter optimization for EUV short-range effect utilizing MPC model calibration techniques , Yohei Torigoe, Itaru Ono, Ahmad Syukri, Yutaro Sato, Nippon Control System Corp. (Japan); Sun Young Kim, Boram Lee, Sukho Lee, Eok Bong Kim, Sanghee Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea) 13216-18 • Evaluating high-throughput mask systems for mainstream technology applications , Martin Glimtoft, Robert Eklund, Mikael Wahlsten, Mats Rosling, Anders Svensson, Mycronic AB (Sweden); Youngjin Park, Mycronic Co., Ltd. (Republic of Korea); Yukihiro Fujimura, Izumi Hotei, Mei Ebisawa, Yusuke Shoji, Shingo Yoshikawa, Dai Nippon Printing Co., Ltd. (Japan)

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	POSTERS	POSTER SESSION—MONDAY Symposium attendees are invited to attend the Poster Session on Monday evening. This session provides an opportunity for attendees to meet with colleagues, network, view posters and interact with the authors. Attendees are requested to wear their conference registration badges.
POSTER SETUP: MONDAY 2:30 PM TO 6:00 PM		
13215-50 • The effect of TiO₂ film on the surface roughness and optical properties of Mo/Si periodic films by atomic layer deposition , Chao-Te Lee, Wen-Hao Cho, Wei-Chun Chen, Hung-Pin Chen, Taiwan Instrument Research Institute (Taiwan); Bor-Yuan Shew, National Synchrotron Radiation Research Ctr. (Taiwan); Cheng-Chung Jaing, Minghsin Univ. of Science and Technology (Taiwan); Chien-Lin Lee, Kuen-Yu Tsai, Department of Electrical Engineering National Taiwan University (Taiwan)		13216-68 • contour-based mask quantization methodology for curvilinear ILT mask and on wafer performance analysis , Futian Wang, Juan Wei, Xiaonan Liu, Yu Mu, Cuixiang Wang, Enqiang Tian, Song Sun, Ruihua Liu, Jiahao Xi, Yufei Sha, Di Liang, Hao Yang, Miao Jiang, Qingchen Cao, Jiangliu Shi, Beijing Superstring Academy of Memory Technology (China)
13215-51 • Dissolution dynamics of poly(4-hydroxystyrene) partially protected with t-butoxycarbonyl group in alkyl trimethyl ammonium hydroxide aqueous developers , Jiahao Wang, Takahiro Kozawa, Osaka Univ. (Japan)		13216-70 • Accurate ILT model calibration using curvilinear mask and all-angle gauges , Juan Wei, Peng Xu, Guangyu Sun, Jingkang Qin, Jinlai Liu, Cuixiang Wang, Futian Wang, Jiangliu Shi, Qingchen Cao, Beijing Superstring Academy of Memory Technology (China)
13215-52 • The two-mask stage scanner for high-NA EUV lithography , Kiwamu Takehisa, O2 Laser Lab. (Japan)		13216-71 • Practical challenges of Bezier curves in Mask Data Preparation: The dark side of implicit Bezier curve representation , Masakazu Hamaji, Rie Funoki, Taigo Fujii, Aki Shigeta, Tomokazu Hayashi, Shuichiro Ohara, Nippon Control System Corp. (Japan)
13215-53 • Development of a porous patterned membrane with a large field size for EUV pellicle , Tae Joong Ha, TDNJ Inc. (Republic of Korea); Gi-sung Lee, National Nanofab Ctr. (Republic of Korea); Haneul Kim, Jungyeon Kim, Jinho Ahn, Hanyang Univ. (Republic of Korea)		13216-72 • Enhancing mask process correction on curvilinear data with Bézier curve representation , Ai Kaneko, Yohei Sogabe, So Yanaihara, Toshikazu Nagatani, Taigo Fujii, Tomokazu Hayashi, Masakazu Hamaji, Nippon Control System Corp. (Japan)
13215-54 • Study on the characteristics of subsurface defect light scattering , Lituo Liu, Wang Na, Xiaojiao Song, Wang Jiayu, Wang Shengyang, Institute of Microelectronics (China)		13216-73 • Accelerated Full-Chip Curvilinear Mask Rule Check , Philippe Hurat, Anwei Liu, Yongjun Kwon, Alan Zhu, Ya-chieh Lai, Cadence Design Systems, Inc. (USA)
13215-55 • Performance testing system of extreme ultraviolet lithography components , Wooram Kim, Eunseok Choe, Do-Yeon Hwang, Sangwoo Kang, Won Chegal, Jung-Hyung Kim, Korea Research Institute of Standards and Science (Republic of Korea)		13216-74 • Reducing Mask Process Correction Time with Hybrid Rule-based and Model-based Solution , Xuan Zhu, Chia-Wei Chang, New Ray Mask Technology Corp. (China); Ao Chen, Yu Zhu, Semiconductor Intelligent Design Automation Technology Ltd. (China)
13215-56 • Outgas evaluation of cable materials for EUV lithography system , Kazuki Hosoda, Takashi Namikawa, Daikin Industries, Ltd. (Japan); Shinji Yamakawa, Tetsuo Harada, Takeo Watanabe, Univ. of Hyogo (Japan)		13216-75 • Optimization of lithography performance at different Manhattan levels of ILT and electron beam shot size , Cuixiang Wang, Yu Mu, Futian Wang, Juan Wei, Ruihua Liu, Enqiang Tian, Di Liang, Yufei Sha, Hao Yang, Song Sun, Miao Jiang, Qingchen Cao, Jiangliu Shi, Beijing Superstring Academy of Memory Technology (China)
13215-57 • Development progress of Gigaphoton's LPP EUV light source for inspection systems , Atsushi Ueda, Fumio Iwamoto, Shinji Nagai, Kenichi Miyao, Hideyuki Hayashi, Takuya Ishii, Yoshifumi Ueno, Tamotsu Abe, Hiroaki Nakarai, Takashi Saitou, Gigaphoton Inc. (Japan)		13216-76 • Quantitative analysis of field intensity distribution effects on patterning results in Laser Direct Writing Lithography , Wei Zhao, Dandan Han, Yayi Wei, Univ. of Chinese Academy of Sciences (China)
13215-58 • Exceptional dimensional stability of non-ferromagnetic Invar alloy for advanced semiconductor manufacturing equipment , Hiromichi T. Fujii, Shingo Matsumura, Naoki Sakaguchi, Haruyasu Ohno, Kotaro Ona, Shinhokoku Material Corp. (Japan)		13216-77 • Non-PFAS biomass EB resist for photomask application , Kazuyo Morita, Oji Holdings Corp. (Japan)
13215-59 • Dry Extreme Ultraviolet Lithography via N-Heterocyclic Carbene-Metal Complexes and Etchant-Free Thermal Development , Downon Kim, Sukwon Hong, Jinhwan Byeon, Sangjin Kim, Gwangju Institute of Science and Technology (Republic of Korea); Yang Hun Yoon, Pohang Accelerator Laboratory (Republic of Korea); Chan-Cuk Hwang, Pohang Accelerator Laboratory, Pohang University of Science and Technology (Republic of Korea)		13216-78 • Study of high contrast PCAR for lithographic performance improvement on EUV blanks , Kei Yamamoto, Kotaro Takahashi, Kazuki Takeda, Hideo Nagasaki, Daisuke Taguchi, FUJIFILM Corp. (Japan); Kazunori Ono, Takahiro Hiromatsu, Taku Hirayama, HOYA Corp. (Japan)
13215-60 • The impact of aberrations in extreme ultraviolet lithography systems on exposure results , Jiashuo Wang, Ziqi Li, Xiaojing Su, Yayi Wei, Institute of Microelectronics (China)		13216-79 • Process matching and mask error characterization of standard mask processes using electron beam (EB) mask simulation , Young M. Ham, Photronics, Inc. (USA); Juergen Preuninger, Hans-Jurgen Stock, Jirka Schatz, Heath Wheeler, Synopsys GmbH (Germany); Chris Progler, Mohamed Ramadan, Photronics, Inc. (USA)
13215-61 • EUV mask defect inspection based on generative adversarial network , Zhuorun Zhou, Xiaobin Wu, Xiaoquan Han, Haoyu Yin, Xuchen Fang, Institute of Microelectronics (China)		13216-80 • Innovative Cr shrinking to improve Tritone mask process and inspectability , Shizhang Zhuang, Tianguo Deng, Yanghui Liu, KLA China (China); Decai Liao, Wei Gan, Zhengzhou Tian, Ren Bao, Haiming Ge, New Ray Mask Technology Corp. (China)
13215-62 • Prediction of 3D Morphological Features of Nano-Patterns from SEM Images Using a Frequency Domain Approach , Ge Liu, Institute of Microelectronics (China), Univ. of Chinese Academy of Sciences (China); Libin Zhang, Le Ma, Yayi Wei, Yajuan Su, Institute of Microelectronics (China)	13216-81 • Productivity enhanced mask inspection application for mature node coverage , Maxwell Lee, Eric Wang, Ken Yang, Colbert Lu, Taiwan Mask Corp. (Taiwan); Elton Lin, Connie Lin, Pei-Ying Lin, Adrian Li, KLA Taiwan (Taiwan); Dongsheng Fan, KLA Corp. (USA)	

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POSTER SESSION—MONDAY CONTINUED		
POSTERS	13215-63 • Plasma Dynamics and Future of LPP-EUV Source for Semiconductor Manufacturing II , Hakaru Mizoguchi, Kyushu Univ. (Japan); Kentaro Tomita, Hokkaido Univ. (Japan); Daisuke Nakamura, Yukihiko Yamagata, Kyushu Univ. (Japan); Takeshi Higashiguchi, Utsunomiya Univ. (Japan); Takashi Toshima, Hiroki Kondo, Takuji Sakamoto, Tanemasa Asano, Masaharu Shiratani, Kyushu Univ. (Japan); Atsushi Sunahara, Purdue Univ. (USA)	13216-82 • Testing plan of NA 0.8 deep UV objective system for semiconductor defect inspection , Yunjong Kim, Jihun Kim, Korea Astronomy and Space Science Institute (Republic of Korea), Univ. of Science and Technology (Republic of Korea); JaeHee Byun, HanRim Chae, KyoungSang Moon, Green Optics Co., Ltd. (Republic of Korea); Minkyu Jung, Wonbin Choi, Ingu Chang, SMTech Co., Ltd. (Republic of Korea); Hyunil Cho, Green Optics Co., Ltd. (Republic of Korea)
	13215-64 • EUV spectral responsivity standard for dose calibration process , Yi-Chen Chuang, Wen-Chun Liu, Cheng-Hsien Chen, Industrial Technology Research Institute (Taiwan)	13216-83 • Non-chemical electrolyzed ion waters for EUV mask cleaning , HyungWon Kim, EW Technology (Republic of Korea); Sungmin Lim, SEEMS BIONICS Inc. (Republic of Korea); Insik Choi, ByungSun Choi, Jaeyoung Kim, EW Technology (Republic of Korea); Kunkul Ryoo, Soonchunhyang Univ. (Republic of Korea); Younwon Jung, EW Technology (Republic of Korea)
	13215-66 • Improving Etchability of Challenging Materials through the Ion Implantation Process , Yunsoo Kim, Dongmin Jeong, Seungho Lee, Hanyang Univ. (Republic of Korea); Myung-Jin Kim, Bom-Sok Kim, Radpion Inc. (Republic of Korea); Jinho Ahn, Hanyang Univ. (Republic of Korea)	13216-84 • In-situ Acoustic Characterization of a MegPie™ Megasonic Transducer for Photomask Cleaning using a Wireless Sensor Array , Nicolas Candia, Claudio Zanelli, Onda Corp. (USA); Don Watson, ProSys, Inc. (USA); Petrie Yam, Onda Corp. (USA)
	13215-67 • Diffraction Efficiency Measurements of two-window-transmission grating for EUV and Beyond EUV Interference Lithography , Rikuya Imai, Shinji Yamakawa, Tetsuo Harada, Univ. of Hyogo (Japan)	13216-85 • Homogeneity measurement of CaF2 optical window using a DUV Fizeau interferometer , Jae-Hyuck Choi, Hagyoung Kihm, Korea Research Institute of Standards and Science (Republic of Korea)
	13215-68 • High Performance C/B Multilayer for Beyond EUV Lithography , Umi Fujimoto, Shinji Yamakawa, Tetsuo Harada, Univ. of Hyogo (Japan)	13216-86 • First demonstration of MEMS Fabry-Perot pixel arrays for reprogrammable photomasks , Md Iftekharul Islam, Amrid Amnache, Univ. de Sherbrooke (Canada); Richard Beaudry, Maurice Delafosse, Digitho Technologies Inc. (Canada); Serge Ecoffey, Luc G. Fréchette, Univ. de Sherbrooke (Canada)
	13215-69 • A process friendly organic dry development rinse material aims towards MOR patterning for High-NA EUV , Yee Seng Chan, Nissan Chemical Corp. (Japan)	13216-87 • Overlay results on halftone FPD photomasks with an advanced high productivity lithography system , Konrad F. Rössler, Steffen Diez, Matthias Wahl, Tony Chen, Heidelberg Instruments Mikrotechnik GmbH (Germany)
	13215-70 • Study of dissolution mechanism and printability of positive tone organometallic resist with alkyl acetate developers , Kohei Machida, Satoshi Enomoto, Shunya Honda, Toyo Gosei Co., Ltd. (Japan); Akihiro Konda, Eich Nomura, Takahiro Kozawa, Osaka Univ. (Japan)	13216-88 • Automatic classification of EUV mask defects using DUV inspection optics , Venkata Rama Samir Bhamidipati, Aravindh Rajiv, Mark Pereira, Sankaranarayanan Paninjath, Neha Razdan, Siemens EDA (India) Pvt. Ltd. (India); Jinhuk Choi, Jonghoon Lim, Sujeong Won, Dongwook Lee, SK hynix Inc. (Republic of Korea); Woojin Kim, Jongha Park, Siemens EDA (Republic of Korea); Stephen H. Kim, Siemens EDA (USA)
	13215-71 • Development of Reflection Type Soft X-ray Projection Microscope for the Spatial Distribution Imaging of Resist Thin Film , Shuhei Iguchi, Shinji Yamakawa, Tetsuo Harada, Univ. of Hyogo (Japan)	13216-89 • Application of KRF PSM in ARF photolithography processing , Sierra Shapiro, GlobalFoundries (USA); Sia Kim Tan, GlobalFoundries Singapore Pte. Ltd. (Singapore); Christopher Magg, Joerg Paufler, Nathan Neal, GlobalFoundries (USA)
	13215-72 • Photoemission Electron Microscopy (PEEM) Study of Chemical Composition on the Surface of EUV Resist Thin Films , Tsukasa Sasakura, Shinji Yamakawa, Tetsuo Harada, Univ. of Hyogo (Japan)	13216-90 • Ultra-fast high fidelity Aerial Image Simulation with Lithography-embedded Deep Learning Model , Paul Lou, Samantha Corber Lou, Exigent Solutions, Inc. (USA)
	13215-73 • Broadband reflective spectrometer for high-resolution spectral characterization of radiation sources , Ismael Gisch, Sophia Schröder, Sven Glabisch, RWTH Aachen Univ. (Germany); Sascha Brose, RWTH Aachen Univ. (Germany); Jülich Aachen Research Alliance (Germany), Fraunhofer-Institut für Lasertechnik ILT (Germany); Serhiy Danylyuk, Fraunhofer-Institut für Lasertechnik ILT (Germany), Jülich Aachen Research Alliance (Germany); Jochen Stollenwerk, Carlo Holly, RWTH Aachen Univ. (Germany), Jülich Aachen Research Alliance (Germany), Fraunhofer-Institut für Lasertechnik ILT (Germany)	13216-91 • Accelerated failure analysis of pellicle materials for EUV lithography via hydrogen plasma exposure , Shih-Hsiang Chou, Yu-Wei Chen, National Yang Ming Chiao Tung Univ. (Taiwan); Hao Tung Chung, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Yen-Cheng Chiu, National Yang Ming Chiao Tung Univ. (Taiwan); Kuo Lun Tai, Chien-Min Lee, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Wen-Wei Wu, Yen-Lin Huang, National Yang Ming Chiao Tung Univ. (Taiwan)
	13215-74 • Durability tests of EUV mask blank under scanner environment , Teruki Hoshino, Yohei Ikebe, Takahiro Onoue, HOYA Corp. (Japan)	13216-92 • Imaging performance and pattern fidelity co-optimization through source optimization , Min-woo Kim, Da-Kyung Yu, Yu-Jin Chae, Hee-Chang Ko, Ji-Won Kang, Hanyang Univ. (Republic of Korea); Michael Yeung, Fastlitho Inc. (USA); Seung-Woo Son, Hye-Keun Oh, Hanyang Univ. (Republic of Korea)
	13215-75 • Residue particle contamination control in advanced EUV pod , Asheesh Nautiyal, Gudeng Precision Industrial Co., Ltd. (Taiwan)	13216-93 • Improving Process Window and Resolution through Polarization in High NA EUV , YuJin Chae, Min-Woo Kim, Da-Kyung Yu, Hee-Chang Ko, Ji-Won Kang, Ji-Hyeon Jeon, Hanyang Univ. (Republic of Korea); Michael Yeung, Fastlitho Inc. (USA); Seung-woo Son, Hye-Keun Oh, Hanyang Univ. (Republic of Korea)

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	POSTER SESSION—MONDAY CONTINUED	
POSTERS	13215-76 • Tailoring the support constraint of phase retrieval algorithms improves lensless EUV nanostructures metrology , Paolo Ansuinelli, Iacopo Mochi, Paul Scherrer Institut (Switzerland)	13216-94 • Novel extreme ultraviolet(EUV) lighting sources with carbon nanotube(CNT) based cold cathode electron beam(C-beam) irradiation technique , Kyu Chang Park, Kyung Hee Univ. (Republic of Korea)
	13215-77 • Electron Blur Evaluation for Different Electron Energies , Oleg Kostko, Lawrence Berkeley National Lab. (USA); Maximilian Mueller, San José State Univ. (USA); Patrick Naulleau, EUV Technology (USA)	13216-95 • Next-Generation DPP EUV Light Source to Support the HVM Lithography Ecosystem , Chris Lee, Energetiq Technology, Inc. (USA)
	13215-78 • Concept and feasibility update on EUV LPOD development , Elson Tu, Gudeng Precision Industrial Co., Ltd. (Taiwan)	13216-96 • Critical Dimension Advanced Statistical Process Control closed-loop system in Photomask Manufacturing , Emmanouil Vogiatzis, Eric Bawden, Jinju Beineke, Michael Goldberg, Photonics, Inc. (USA); Sandro Pampel, Photonics MZD GmbH (Germany); David A. Kazlauskas, Roger Kutzy, Jay Patel, Chris Sullivan, Photonics, Inc. (USA); Hannes Kullig, Andreas Wittig, Rene Born, Ralf Schrader, Photonics MZD GmbH (Germany); Sebastian Brosig, Photonics (UK) Ltd. (United Kingdom); Daniel Paulick, Photonics MZD GmbH (Germany); Peter Craig, Photonics, Inc. (USA); Huw Fryer, Christopher Cooke, Gareth Davies, Lewis Kref, Photonics (UK) Ltd. (United Kingdom); Tony Schievelbein, Martin Carrier, Andre Garman, Dave Lucas, Photonics, Inc. (USA); Martine Barnes, Photonics (UK) Ltd. (United Kingdom); Debbie Wierzbicki, Chris Proglor, Photonics, Inc. (USA)
	13215-79 • A new isotropic molybdenum type with exceptional room temperature ductility , Christina Biebach, Christoph Adelhelm, Alexander Lorich, David Zacharias, PLANSEE SE (Austria)	13216-99 • Health inspection of EUV pellicles with emphasis on thickness and transparency of CNT pellicles , Emile van Veldhoven, Canatu Oy (Finland); Jochen Mielke, Horiba Europe GmbH (Germany)
	13215-80 • Understanding the fundamental limitations of PMMA resist for EUV exposures , Amir Hegazy, Amanda Berryman, Christian Francisco, Gregory Denbeaux, Univ. at Albany (USA)	
	13215-82 • LDP EUV source performance and cost-of-ownership improvement , Yusuke Teramoto, Ushio Germany GmbH (Germany); Safak Sayan, Intel Corp. (USA); Shunichi Morimoto, Teruaki Kawajiri, Koji Suzuki, Fuki Sato, Akihisa Nagano, Noritaka Ashizawa, Hidenori Watanabe, Kazuya Aoki, Yoshihiko Sato, Ushio Inc. (Japan)	
	13215-83 • Underlayer dependent local wafer deformation during EUV exposure , Hee-Chang Ko, Ji-Won Kang, Ji-Hyun Jeon, Seung-Woo Son, Hye-Keun Oh, Hanyang Univ. (Republic of Korea)	
	13215-84 • The relationship between CD behavior and photo-resist thickness , Shao Kang Chen, Taiwan Mask Corp. (Taiwan)	
	13215-85 • A Semi-Empirical Approach for Predicting LER Statistical Distribution in Advanced Nodes , Xin Hong, Xiaojing Su, Zixi Liu, Xiaohuan Ling, Yuqin Wang, Pengyu Ren, Yujie Jiang, Yajuan Su, Yayi Wei, Institute of Microelectronics (China)	
	13215-86 • Source optimization for the whole arc slit with minimum OPC applied to contact hole patterns , Da-Kyung Yu, Min-Woo Kim, Gug-Young Kim, Yu-Jin Chae, Seung-Woo Son, Hanyang Univ. (Republic of Korea); Michael Yeung, Fastlitho Inc. (USA); Hye-Keun Oh, Hanyang Univ. (Republic of Korea)	
	13215-88 • Plasma physics kinetics for extreme ultraviolet sources at Princeton Plasma Physics Laboratory , Alec Griffith, Princeton Plasma Physics Lab. (USA); Anatoli Morozov, Kirill V. Lezhnin, Samuel R. Totorica, Princeton Univ. (USA); Will Fox, Ahmed Diallo, Princeton Plasma Physics Lab. (USA)	
	13215-89 • Inspection of next generation EUV resists with NP-SIMS , Greg Swieca, California State Univ., Northridge (USA); Won-Il Lee, Shixian Ha, Stony Brook Univ. (USA); Nikhil Tiwale, Chang-Yong Nam, Brookhaven National Lab. (USA); Michael J. Eller, California State Univ., Northridge (USA)	
	13215-90 • Relative lifetime estimation of EUV pellicles: Impact of power, residual stress, and defects through a fatigue analysis , Ji-Hyun Jeon, Ji-Won Kang, Hee-Chang Ko, Seung-Woo Son, Hye-Keun Oh, Hanyang Univ. (Republic of Korea)	
	13215-103 • All-dry zinc-imidazolate resists for electron beam and EUV lithography , Kayley Waltz, Patrick Eckhart, Peter Corkery, Johns Hopkins Univ. (USA); Mueed Ahmad, Brookhaven National Lab. (USA); Andrea Kraetz, Yurun Miao, Dennis T. Lee, Mohammed K. Abdel-Rahman, Johns Hopkins Univ. (USA); Yucheng Lan, Paul Haghi-Ashtiani, Morgan State Univ. (USA); Aaron Stein, J. Anibal Boscoboinik, Brookhaven National Lab. (USA); Michael Tsapatsis, Howard Fairbrother, Johns Hopkins Univ. (USA)	

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	TUESDAY 1 OCTOBER	
MORNING	SESSION 4 • 8:15 AM - 9:45 AM Process Control for EUV Session Chairs: Winfried M. Kaiser , Carl Zeiss SMT GmbH (Germany), Masahiko Harumoto , SCREEN Semiconductor Solutions Co., Ltd. (Japan)	SESSION 4 • 8:00 AM - 10:05 AM Inspection, Repair, and Cleaning Session Chairs: Ray Shi , KLA Corp. (USA), Uwe F.W. Behringer , UBC Microelectronics (Germany)
	13215-16 • Massive on-cell overlay metrology solution based on Mueller-matrix analysis for advanced process control , Changhyeong Yoon, Hyukjoon Cho, Ji Yong Shin, Kihun Kang, Juntaek Oh, Donggun Lee, Jaehyun Son, Eunsoo Hwang, Jinwoo Ahn, Jaewon Lee, Taeyong Jo, Byungkwan Oh, Seunga Lim, Taehyun Yun, Jinsoo Lee, Byeongki Kang, Jeongho Ahn, Seulki Kim, Jihye Lee, Hidong Kwak, Yusin Yang, Younghoon Sohn, Myungjun Lee, SAMSUNG Electronics Co., Ltd. (Republic of Korea)	13216-1 • INVITED PAPER Actinic Pattern Mask Die-to-Database Inspection for High-NA EUV Lithography , Toshiyuki Todoroki, Takashi Hanamoto, Takashi Kamochi, Ko Gondaira, Lasertec Corp. (Japan); Arosha Goonesekera, Lasertec U.S.A., Inc. (USA); Hiroki Miyai, Lasertec Corp. (Japan)
	13215-17 • Comprehensive EUV fab data management solution bridging reticle and wafer inspections , Alice Fu, Howard Lin, Calvin Hung, Bingrui Li, Ellis Lu, Micron Technology Taiwan, Inc. (Taiwan); Xinya Liu, KLA China (China); Masaki Satake, KLA Japan (USA); Daojing Li, Will Wang, Wallace Wang, Zeyu Lei, Brian Du, Derui Li, KLA China (China); Yao Zhang, Daniel Price, Vikram Tolani, KLA Corp. (USA); Narayani Narasimhan, KLA Software India Pvt. Ltd. (India); Brandon Hurt, Ryan Carlson, Micron Technology, Inc. (USA)	13216-21 • Adoption of Darkfield Blank Inspector to Enhance Yield of Optical Reticles , Rick Li, Yifei Yu, Xavier Chen, Kevin Wang, KLA China (China)
	13215-18 • Enabling Tighter Process control and accelerating Time to Yield in angstrom Process Nodes with accurate and precise EPE measurements , Tarun Raheja, Sankalp Verma, Applied Materials India Pvt. Ltd. (India)	13216-22 • Realize 193 nm inspection for EUV mask , Cheng Kuang Chen, Shin An Ku, T.H. Hsu, Chin-Kun Wang, C.L. Lu, C.L. Wu, C.W. Wen, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Cyrus Chen, Yenlin Chen, Jim Wang, Joanne Tsai, Ling-Chuan Tsao, Yu-Chia Chiang, Ya-Chien Chang, Yi-Hui Zhuo, Yu-Chieh Huang, Ying-Hui Chen, Dongsheng Fan, Amo Chen, Dongxue Chen, Mingwei Li, KLA Corp. (USA)
	13215-19 • Enhancing Lithography Precision: Characterizing Resist Profiles in Semiconductor Manufacturing with Rapid Probe Microscopy , Lei Feng, Vishal Panchal, Richard Thorogate, James Robinson, John Cossins, Andrew D. L. Humphris, Infinitesima Ltd. (United Kingdom); Vidya Vaenkatesan, Jo Finders, ASML Netherlands B.V. (Netherlands)	13216-23 • Advanced EUV Printability Simulation Study of Photomask Repair Solutions , Tod E. Robinson, BRUKER RMR (USA) 13216-19 • Repair processes on next generation EUV materials , Cheng Kuang Chen, Pei En Weng, Chien-Wei Chiang, P.S. Chen, C.W. Wen, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Gerson Mette, Christian Felix Hermanns, Thorsten Hofmann, Klaus Edinger, Carl Zeiss SMT GmbH (Germany); Y.F. Li, Carl Zeiss Co., Ltd. (Taiwan)
	13215-20 • Single exposure EUV patterning optimization and defect inspection of hexagonal contact hole arrays using voltage contrast metrology , Shubhankar Das, Victor M. Blanco Carballo, Bappaditya Dey, imec (Belgium); Xiang Liu, Tokyo Electron Europe Ltd. (Belgium); Guillaume Schelcher, Danilo De Simone, imec (Belgium)	13216-20 • Advanced Absorber and Compensation Repair for EUV reticles utilizing a novel e-beam based Repair Technique , Joseph M. Rodriguez, Scott Chegwidden, Andrew Elliott, Lingxuan Peng, Dinumol Devasia, Nathan Wilcox, Safak Sayan, Intel Corp. (USA); Andrew Ridley, Chanya Nguyen, Felix Hermanns, Klaus Edinger, Franz-Josef Eberle, Michael Budach, Horst Schneider, Carl Zeiss SMT GmbH (Germany)
	13215-21 • Applying Deformable Image Registration in Design Based Metrology towards faster adoption of EUV Lithography in advanced process nodes , Tarun Raheja, Sankalp Verma, Nitish Kumar, Kunal Yadav, Applied Materials India Pvt. Ltd. (India)	13216-97 • MeRiT[®] MG neo: a new repair solution for the mature market , Sebastian Vollmar, Michael Brendel, Alessandro Franceschi, Carl Zeiss SMT GmbH (Germany) 13216-24 • Rapid freeze-cleaning method , Satoshi Nakamura, Kensuke Demura, Masashi Yamage, Shibaura Mechatronics Corp. (Japan); Kei Hattori, Nagoya Univ. (Japan); Masaya Kamiya, Shibaura Mechatronics Corp. (Japan)
EXHIBITION HALL, SERRA BALLROOM	Coffee Break	

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MORNING	SESSION 5 • 10:25 AM - 12:20 PM Pellicle Session Chairs: Herman H. P. Th. Bekman , TNO (Netherlands), Shinji Okazaki , ALITECS Co., Ltd. (Japan) 13215-22 • INVITED PAPER EUV Mask Defect Mitigation Strategy at Samsung Foundry , Jongkil Choi, Suyeon Chae, Hyunjin C., Jinhyuk Kim, Dongsik Jung, Sang H. Lee, SAMSUNG Electronics Semiconductor (Republic of Korea) 13215-23 • INVITED PAPER Unveiling the individual impact of hydrogen radicals and vacuum EUV photons on pellicle-like materials under varying thermal conditions , Görsel Yetik, Herman H.P. T. Bekman, Jacqueline van Veldhoven, Shriparna Mukherjee, Karima Tabakkouht, Henk A. Lensen, TNO (Netherlands) 13215-24 • Evaluation of Ultra-thin Membrane for EUV Pellicles Using Metal Core Materials , Takashi Tanimura, Takashi Ryu, Koichi Masuda, Toshikatsu Kashiwaya, Shoji Tange, Yasuaki Tanaka, Hiroki Iida, Tetsuro Yoshioka, NGK Insulators, Ltd. (Japan) 13215-25 • Low density diamond-like carbon for pellicle application , Mohammad Saghayezhian, JoJo Daof, Vincent Ip, Katrina Rook, Meng Lee, Marjorie Chee, Joshua Park, Veeco Instruments Inc. (USA) 13215-26 • Multilayered EUV pellicle: enhanced mechanical strength and thermal stability , Young Woo Kang, Haneul Kim, Jungyeon Kim, Young Wook Park, Jinho Ahn, Hanyang Univ. (Republic of Korea) 13215-27 • Advanced EUV Pellicle development for High-Power Applications , Juhee Hong, Purwar Prashant, Munsu Choi, Donghoi Kim, Dongyeong Yoo, Chulkyun Park, Kwanhwi Jung, Soonyeol Kwon, Byeongsung Yoo, Namhee Lee, Younsoo Park, Byoungcheon Seong, Yongdae Kim, S&S Tech Co., Ltd. (Republic of Korea)	SESSION 5 • 10:35 AM - 12:00 PM Mask Metrology Session Chairs: Thomas Franz Karl Scheruebl , Carl Zeiss SMS Ltd. (Germany), Byung Gook Kim , E-SOL, Inc. (Republic of Korea) 13216-26 • INVITED PAPER AIMS* EUV 3.0 - Next generation actinic mask review and beyond @ ZEISS , Sven Krannich, Renzo Capelli, Swen Ballof, Marc Schneider, Stefan-Markus Mueller, Sascha Perlitz, Carl Zeiss SMT GmbH (Germany) 13216-27 • INVITED PAPER Sub-angstrom critical dimension metrology with EUV scatterometry , Stuart Sherwin, Matt Hettermann, Dave Houser, Luke Long, Patrick Naulleau, EUV Technology (USA) 13216-28 • AFM Nano-IR for photomask in-line defect characterization , Mitchell First, Elba Gomar-Nadal, Farhood Rasouli, Jeff Hsiao, Malahat Tavassoli, Intel Corp. (USA); Chunzeng Li, Jian Liang, Ingo Schmitz, Bruker (USA) 13216-29 • Metrology-class EUV light source based on copper-tape laser produced plasma , Seth L. Cousin, EUV Technology (USA) 13216-30 • Novel metrology for mask degradation: IR-AFM and Hard X-ray XPS depth profiling , Véronique de Rooij, Chien-Ching Wu, Rob P. Ebeling, Komal Pandey, Maarten van Es, Shriparna Mukherjee, TNO (Netherlands); Rik Jonckheere, imec (Belgium)
MONTEREY CONF. CTR., SERRA BALLROOM	Lunch/Exhibition Break	
AFTERNOON		SESSION 6 • 1:20 PM - 3:05 PM Defect, Printability, Handling, and Pellicle Session Chairs: Vicky Philipsen , imec (Belgium), Ted Liang , Intel Corp. (USA) 13216-31 • A study on programmed defect propagation from design to mask to wafer using SEM metrology , Balakumar Baskaran, Mohamed Saib, Bojja Aditya Reddy, Matteo Beggiano, Mihir Gupta, Christophe Beral, Anne-Laure Charley, Gian Lorusso, Joost Bekaert, Philippe Leray, imec (Belgium) 13216-32 • Advanced Deep Learning for Defect Identification in Photomasks , Oluseyi A. Oyediji, Cranfield Univ. (United Kingdom); Ibiyinka T. Ayorinde, Univ. of Ibadan (Nigeria) 13216-72 • Predictive printability assessment of EUV mask defects , Nicole Wu, Nanya Technology Corp. (Taiwan); Thomas Muelders, Jirka Schatz, Martin Bohn, Mariya Braylovska, Synopsys GmbH (Germany); Chun-Cheng Liao, Nanya Technology Corp. (Taiwan); John Tsai, Elsley Tan, Synopsys Taiwan Co., Ltd. (Taiwan); Evgenii Sukhov, Synopsys GmbH (Germany) 13216-33 • Development and application of SEBS mounted on EUV mask blank , Asheesh Nautiyal, Gudeng Precision Industrial Co., Ltd. (Taiwan) 13216-34 • Enhancing Fab Yield with the High-Reliability Automation Application Reticle Analyzer™ (RA) , Dongmei Wu, KLA China (China); Olivier Fagart, Laurent Lecarpentier, STMicroelectronics S.A. (France); Suresh Lakkapragada, KLA (USA); Changqing Hu, KLA Corp. (USA); Yuehui Wang, Li Xie, Derui Li, Jing Jiao, Zeyu Lei, KLA China (China); Vikram Tolani, KLA Corp. (USA); Marco Polli, KLA Europe (Italy) 13216-35 • Characteristics of CNT Pellicle Membrane under Hydrogen Plasma Torture Test via TEM and SEM Images , Pei-Chen Wu, Yen-Liang Chen, Chien-Min Lee, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan); Wen-Wei Wu, Yen-Lin Huang, National Yang Ming Chiao Tung Univ. (Taiwan); Shy-Jay Lin, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan) 13216-36 • Improved CNT based pellicles for low and high-power EUV lithography , Márcio D. Lima, Lintec of America, Inc. (USA)
EXHIBITION HALL, SERRA BALLROOM	Coffee Break DESSERT IN EXHIBITION HALL • 3:00 PM - 3:45 PM Enjoy dessert in the Exhibition Hall while networking with exhibitors.	

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AFTERNOON		SESSION 7 • 3:35 PM - 4:50 Mask Writers and E-beam Resist Session Chairs: Naoya Hayashi , Dai Nippon Printing Co., Ltd. (Japan), Jed H. Rankin , IBM Corp. (USA) 13216-37 • INVITED PAPER Multi-Beam Mask Writers in the high-NA EUV era , Elmar Platzgummer, Christoph Spengler, Christof Zillner, Mathias Tomandl, Christof Klein, Hans Loeschner, IMS Nanofabrication GmbH (Austria) 13216-38 • INVITED PAPER Recent advancement and future plans on electron multi-beam mask writers , Jumpei Yasuda, Tomoo Motosugi, Hayato Kimura, Kenichi Yasui, Hiroshi Matsumoto, Michihiro Kawaguchi, Yoshinori Kojima, Masato Saito, NuFlare Technology, Inc. (Japan) 13216-41 • Meander writing, to further enhance maskshop productivity with the SLX laser mask writer Author(s): Robert Eklund, Mycronic AB (Sweden) 13216-43 • INVITED PAPER Study of low sensitivity EB resist for future generation , Kei Yamamoto, Kotaro Takahashi, Kazuki Takeda, FUJIFILM Corp. (Japan)
WEDNESDAY 2 OCTOBER		
8:10 - 9:30 AM LOCATION: MONTEREY CONF. CTR., STEINBECK BALLROOM	Wednesday All-Symposium Plenary Session Chairs: Seong-Sue Kim , Seoul National Univ. (Republic of Korea); Eric M. Panning , Lavorro Inc. (USA) From ‘system on a chip’ to ‘system of chips: Hyperconvergence in design and manufacturing (Plenary Presentation), Srinivas Raghvendra , Synopsys, Inc. (USA) EUV mask technologies: Evolution and ecosystem for devices (Plenary Presentation), Jin Choi , SAMSUNG Electronics Co., Ltd. (Republic of Korea)	
EXHIBITION HALL, SERRA BALLROOM	Coffee Break • 9:30 AM - 10:00 AM	
10:05 - 11:55 AM	SESSION 6	SESSION 8
	JOINT SESSION WITH PHOTOMASK AND EUVL: PROSPECTS OF EUV BLANKS Session Chair: Tetsuo Harada , Univ. of Hyogo (Japan), Ted Liang , Intel Corp. (USA)	
	13216-44 • INVITED PAPER EUV Mask Blanks with Low-n Absorber , Hitoshi Maeda, Yohei Ikebe, Masanori Nakagawa, Takuro Ono, Takahiro Onoue, HOYA Corp. (Japan)	
	13215-28 • INVITED PAPER New EUV mask and blanks for DRAM 1a nm and beyond , Hiroshi Hanekawa , Yoshiaki Ikuta, AGC Inc. (Japan); Jongsub Kim , Hyunman Jo , Sangjin Jo , Euisang Park , Sungha Woo , Chanha Park , SK hynix Inc. (Republic of Korea)	
	13215-29 • Development of advanced EUV mask absorbers with various properties , Daisuke Miyawaki, Daisuke Sakurai, Hideaki Nakano, Itaru Yoshida, Kazunori Seki, Yosuke Kojima, Toppan Photomask Co., Ltd. (Japan)	
	13216-45 • INVITED PAPER Mo/Ru/Si multilayers optimized for High-NA EUV mask blanks , Antonio Checco, Katrina Rook, Kenji Yamamoto, Marjorie Chee, Meng H. Lee, Veeco Instruments Inc. (USA)	
	13216-46 • The influence of reflectivity on EUV lithography performance of low-n and binary masks for random logic via implementation , Ling Ee Tan, Fergo Treska, Werner Gillijns, Jeroen Van de Kerckhove, Vicky Philipsen, Ryoung-Han Kim, imec (Belgium)	
	13215-30 • Understanding best focus shift on logic contact patterning in EUV attenuated phase-shift mask , Eun Sung Kim, Sejin Park, Hyungkwan Park, Jaemyoung Lee, Sung Gon Jung, SAMSUNG Electronics Co., Ltd. (Republic of Korea)	
MONTEREY CONF. CTR., SERRA BALLROOM	Lunch/Exhibition Break • 11:45 AM - 1:20 PM	

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AFTERNOON	SESSION 7 • 1:20 PM - 3:15 PM Resist Fundamentals Session Chairs: Takahiro Kozawa , SANKEN, Osaka Univ. (Japan), Ricardo Ruiz , Lawrence Berkeley National Lab. (USA) 13215-31 • INVITED PAPER BEFORCE : a pathway to unravel metal oxide resist (MOR) reactions upon EUV exposure, bake and environment , Ivan Pollentier, Fabian Holzmeier, Kevin Dorney, Hyo Seon Suh, imec (Belgium) 13215-32 • Time-dependent characterization of total electron yield and outgassing in model EUV resist materials , Bernhard Lüttgenau, Meng Zhang, Qi Zhang, Cheng Wang, Ricardo Ruiz, Michael Connolly, Oleg Kostko, Lawrence Berkeley National Lab. (USA) 13215-33 • Exploring the impact of electron affinity on electron emission in EUV photoresists , Honggu Im, Oleg Kostko, Lawrence Berkeley National Lab. (USA) 13215-34 • Kinetic Modeling of Reactions following EUV Exposure in an ESCAP photoresist , Jacob R. Milton, Samuel M. Blau, Frances A. Houle, Lawrence Berkeley National Lab. (USA) 13215-35 • Modeling spatial statistics of photoresist films , William D. Hinsberg, Columbia Hill Technical Consulting (USA); Frances A. Houle, Lawrence Berkeley National Lab. (USA) 13215-36 • Development kinetics analysis based on frequency and impedance changes measured with quartz crystal microbalance method , Yuqing Jin, Osaka Univ. (Japan); Yuko Tsutsui Ito, Takahiro Kozawa, SANKEN, Osaka Univ. (Japan); Takashi Hasebe, Kazuo Sakamoto, Muramatsu Makoto, Tokyo Electron Kyushu Ltd. (Japan) 13215-37 • INVITED PAPER A SHARP look at mask-side Hyper-NA EUV imaging , Markus P. Benk, Ryan Miyakawa, Weilun Chao, Bruno La Fontaine, Lawrence Berkeley National Lab. (USA)	SESSION 9 • 1:20 PM - 3:20 PM AR/VR, Mask for Photonics, and Nono-imprint Session Chairs: Lawrence S. Melvin , Synopsys, Inc. (USA), Bo Zhao , Meta (USA) 13216-102 • INVITED PAPER Displacement Talbot Lithography: Why does it work and why is it the next generation of photonic patterning , Kelsey Wooley, Eulitha US, Inc. (USA); Harun L. Solak, Zhixin Wang, Eulitha AG (Switzerland) Tetsuo Harada, Shinji Yamakawa, Univ. of Hyogo (Japan) 13216-47 • INVITED PAPER Advancing Miniaturized Sensing and Imaging with Sub-Wavelength Metaoptics , Thang D. Dao, Nikolai Andrianov, Munir Syed Azeem, Jasmin Spettel, Bernardo Realista-Ferreira, Tai Nguyen, Clement Fleury, Silicon Austria Labs. GmbH (Austria) 13216-48 • Metals response to process variation , Andrew M. C. Dawes, Lawrence S. Melvin, Synopsys, Inc. (USA); Maryvonne Chalony, Synopsys, Inc. (France); Betsy Grubbs, Phil Stopford, Jian Rao, Synopsys, Inc. (USA); Rajeev Ranjan, Joachim Siebert, Synopsys GmbH (Germany); JiSoo Park, Synopsys Korea Inc. (Republic of Korea); Ying Zhou, Synopsys, Inc. (USA) 13216-49 • 3-dimensional, high resolution patterning of quartz mask substrates , Christian Buerger, Martin Sczyrba, Benjamin Schwiigel, Haiko Rolf, Advanced Mask Technology Ctr. GmbH Co. KG (Germany) 13216-50 • Scalable and adaptable structural metrology for AR/VR device images based on Deep learning , Subhei Shaar, Maclean Advanced, Bo Zhao, Raja Muthinti, Meta (USA); Ali Hallal, Martin Jacob, Julien Baderot, Sergio Martinez, Johann Foucher, POLLEN Metrology (France) 13216-51 • Nanoimprint lithography performance and applications , Yushi Yamakawa, Toshihiro Ifuku, Masami Yonekawa, Kazuhiro Sato, Tomohiro Saito, Toshiki Ito, Kiyohito Yamamoto, Mitsuru Hiura, Yukio Takabayashi, Keita Sakai, Canon Inc. (Japan) 13216-52 • Development of repairing technology for nanoimprint templates by multiple patterning technology , Takaharu Nagai, Hisayoshi Watanabe, Hideki Cho, Dai Nippon Printing Co., Ltd. (Japan)
EXHIBITION HALL, SERRA BALLROOM	Coffee Break • 3:20 PM - 4:00 PM DESSERT IN EXHIBITION HALL • 3:00 PM - 3:45 PM Enjoy dessert in the Exhibition Hall while networking with exhibitors.	
4:00 - 5:30 PM LOCATION: STEINBECK BALLROOM	Panel discussion: Early high-NA EUV learning and the implications for the future of EUV lithography MODERATOR: Harry Levinson , HJL Lithography (USA) PANELISTS: Mark Phillips , Intel Corp. (USA); Chris Mack , Fractilia (USA); Tom Cecil , Synopsys (USA); Vicky Philipsen , imec (Belgium); Jason Stowers , Inpria Corp. (USA); Seongbo Shim , SAMSUNG Electronics Co., Ltd. (Republic of Korea)	
5:30 - 5:45 PM	SPIE Photomask Technology + EUV Lithography Awards Please join us for the presentation of the 2024 BACUS awards and scholarship.	

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	THURSDAY 3 OCTOBER	
MORNING	SESSION 8 • 8:15 AM - 9:50 AM Sustainability and Productivity Session Chairs: Aysegul Cumurcu Gysen , ASML Netherlands B.V. (Netherlands), Anton Devilliers , TEL Technology Ctr., America, LLC (USA)	SESSION 10 • 8:00 AM - 10:05 AM Curvilinear Mask Technologies and MDP Session Chairs: Aki Fujimura , D2S, Inc. (USA), Jin Choi , SAMSUNG Electronics Co., Ltd. (Republic of Korea)
	13215-38 • INVITED PAPER The Dawn of the New Electronics Industry (Surfing on Chips Acts' waves) , Paolo A. Gargini, IEEE (USA)	13216-113 • INVITED PAPER Curvilinear Masks: Motivations and Metrology , Linyong Pang, D2S, Inc. (USA); Dakota Seal, Tom Boettiger, Micron Technology, Inc. (USA); Nagesh Shirali, Grace Dai, Aki Fujimura, D2S, Inc. (USA)
	13215-39 • INVITED PAPER EUV dose reduction for pitch 28 nm line-space , Mihir Gupta, Lander Verstraete, Joern-Holger Franke, Achintya Kundu, Roberto Fallica, Kurt Ronse, Emily Gallagher, Danilo De Simone, Vicky Philipsen, Hyo Seon Suh, imec (Belgium)	13216-53 • CATS SmartFracture: A new fracture engine for curvilinear and multigon mask data input , Kokoro Kato, Satoshi Mitsuno, Kuninori Nishizawa, Nihon Synopsys G.K. (Japan); Ken Kuo, Synopsys Taiwan Co., Ltd. (Taiwan); Johnny Yeap, Synopsys, Inc. (USA); J.G. Jou, Taiwan Semiconductor Manufacturing Co., Ltd. (Taiwan)
	13215-40 • PFAS-free EUV rinse for advanced technology nodes , Roberto Fallica, Danilo De Simone, Seonggil Heo, Hyo Seon Suh, imec (Belgium)	13216-54 • Sufficient Machine Learning based pattern classification for freeform designs , Lianghong Yin, Marko Chew, Shumay Shang, Le Hong, Fan Jiang, Ingo Bork, Ilhami Torunoglu, Siemens EDA (USA)
	13215-41 • Non-PFAS biomass EUV resist for high-NA EUV lithography , Kazuyo Morita, Oji Holdings Corp. (Japan)	13216-55 • Manhattan and curvilinear mask error correction , Yung-Yu Chen, Chien-Yun Yang, Wen-Li Cheng, Jing-Wei Shih, Synopsys Taiwan Co., Ltd. (Taiwan); John Valadez, Linghui Wu, Synopsys, Inc. (USA)
	13215-42 • Substantial Dose Reduction Using Organic-Based Deposited Underlayer for EUV Lithography While Maintaining Roughness and Minimizing Defects , Achintya Kundu, Mihir Gupta, Danilo De Simone, Hyo Seon Suh, imec (Belgium); David De Roest, Dennis Christy, ASM Belgium N.V. (Belgium); Fatemeh Davodi, ASM Microchemistry Oy (Finland); Yoann Tomczak, Kishan Patel, Steaphan Wallace, Yiting Sun, ASM Belgium N.V. (Belgium)	13216-56 • 34 nm Pitch 4F2 Pillar Patterning Enabled by Curvilinear Mask Geometries , Hemant Kumar Raut, Arijit Das, Mahmudul Hasan, Murat Pak, imec (Belgium)
	13215-43 • Drastic dose reduction of metal oxide resist induced by functional surface treatment process and primers , Taiki Saijo, Nissan Chemical Corp. (Japan)	13216-57 • Multigon-based curvilinear mask rule checks for advanced mask data preparation applications , Amogh Raj, Rachit Sharma, Ranganadh Peesapati, Sayalee Gharat, Siemens EDA (India); Stephen Kim, Ingo Bork, Siemens EDA (USA)
		13216-59 • Multi-scale processing system to simplify curvilinear shapes , Yung-Yu Chen, Chien-Yun Yang, Wen-Li Cheng, Jing-Wei Shih, Synopsys Taiwan Co., Ltd. (Taiwan); John Valadez, Linghui Wu, Synopsys, Inc. (USA)
	13216-117 • Assessing need and methodology for mask constraints in ILT applications , Mohamed Ramadan, Christopher J. Progler, Henry Kamberian, Jinju Beineke, Photronics, Inc. (USA); Michael Green, Photronics Inc (USA); Guangming Xiao, Synopsys, Inc. (USA); Ming-Feng Shen, Kai-Hsiang Chang, Synopsys Taiwan Co., Ltd. (Taiwan); Kyle Braam, Yu-Po Tang, Synopsys, Inc. (USA); Szu Ping Chen, Eric Huang, Gloria Yeh, Nicole Wu, Chun-Cheng Liao, Nanya Technology Corp. (Taiwan)	
STEINBECK LOBBY	Coffee Break	

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	AFTERNOON	<p>SESSION 9 • 10:20 AM - 12:00 PM Patterning, EPE and Defectivity Session Chair: Kurt G. Ronse, imec (Belgium)</p> <p>13215-44 • INVITED PAPER Holistic patterning technology for DRAM 29nm pitch contact hole and pillar patterning, Seunghak Park, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Van Tuong Pham, imec (Belgium); Sang-Ho Yun, Woojin Jung, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Hyo Seon Suh, Lander Verstraete, imec (Belgium); Hyung Jong Bae, Taehoi Park, SAMSUNG Electronics Co., Ltd. (Republic of Korea); Victor M. Blanco Carballo, Seonggil Heo, Kurt Ronse, imec (Belgium); Chan Hwang, SAMSUNG Electronics Co., Ltd. (Republic of Korea)</p> <p>13215-45 • INVITED PAPER Reticle thermal properties impact on overlay at 500W and beyond, Laura Huddleston, Rick Jansen, Emilio Bajonero Canonico, ASML Netherlands B.V. (Netherlands); Ali Mohammadkhal, Carlos Duran, Michael Campion, Roni Levi, Corning Incorporated (USA); Yohei Ikebe, Takahiro Onoue, HOYA Corp. (Japan); Bryan Kasprovicz, HOYA Corp. (Japan); Frank Timmermans, ASML Netherlands B.V. (Netherlands); Justin Rademaker, ASML (Netherlands)</p> <p>13215-46 • Enhanced EUV Photolithography Control for Overcoming Defectivity Challenges, Amit Ohri, Steve Snyder, Vineet Nair, Brian Watson, Kwangho Ahn, Efe Ege, Yashvi Singh, Micron Technology, Inc. (USA); Ethan Lee, Howard Chen, Micron Memory Taiwan Co., Ltd. (Taiwan); Scott Light, Josiah Muthuraj, Lishan Chen, Kevin Weich, John Hobbs, Micron Technology, Inc. (USA)</p> <p>13215-47 • LCDU decomposition and scaling - mask and resist effects on local MEEF and stochastics, Dominykas Gustas, Sam Borman, Dorothe Oorschot, ASML Netherlands B.V. (Netherlands); Joost Bekaert, imec (Belgium); Hilbert Van Loo, Frank Horsten, Vidya Vaenkatesan, Alberto Colina, Tasja van Rhee, ASML Netherlands B.V. (Netherlands)</p> <p>13215-48 • Enabling 0.33 NA EUV lithography patterning towards MP16 SADP semi-damascene metallization, setting the benchmark for high NA EUV, Yannick Hermans, Stefan Decoster, Chen Wu, imec (Belgium); Jan Doise, Inpria Corp. (Belgium); Seongho Park, Vincent Renaud, Paulina A. Rincon-Delgadillo, Zsolt Tokel, imec (Belgium)</p> <p>13215-49 • Novel lithography process for enhanced high numerical aperture EUV patterning performance, Yuhei Kuwahara, Soichiro Okada, Satoru Shimura, Tokyo Electron Kyushu Ltd. (Japan); Kathleen Nafus, Tokyo Electron America, Inc. (USA); Philippe Foubert, imec (Belgium)</p>



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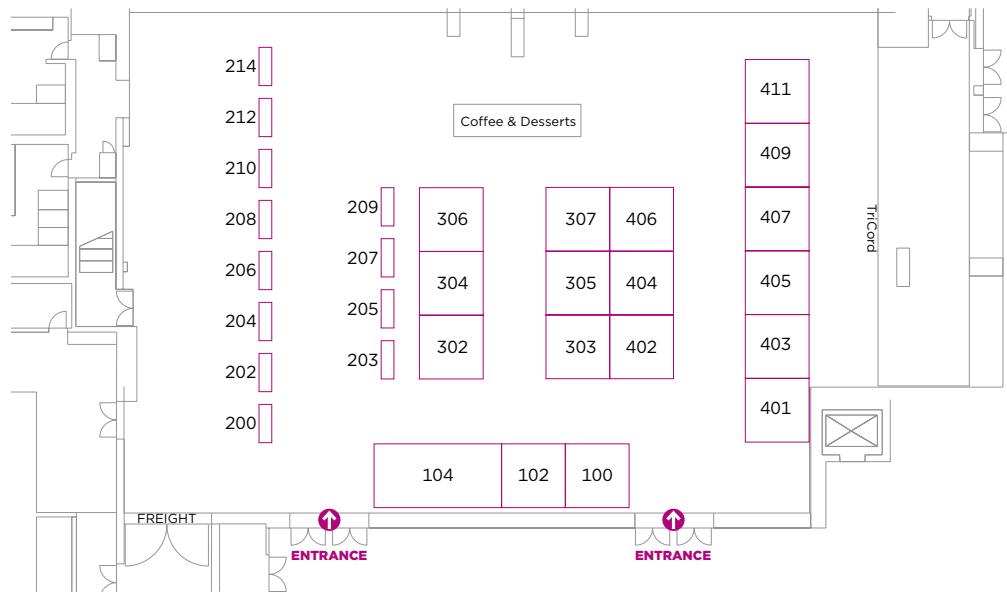
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- 102 ibss Group, Inc.
- 104 Bruker
- 200 ESTION Technologies GmbH
- 202 Mitsui Chemicals America, Inc.
- 203 JENOPTIK Optical Systems, LLC
- 204 POLLEN Metrology Inc.
- 205 Nano-Master, Inc.
- 206 NTT Advanced Technology Corp.
- 207 Oxford Instruments Andor
- 208 Vistec Electron Beam GmbH
- 209 MSP, a Division of TSI
- 210 Lintec of America Inc.
- 302 SmarAct Inc.
- 303 Carl Zeiss SMT GmbH
- 304 Heidelberg Instruments Inc.
- 305 Stratus Vision GmbH
- 306 Gudeng, Inc.
- 307 PLANSEE SE
- 401 HORIBA Instruments Inc.
- 402 Park Systems Inc.
- 403 Canatu Oy
- 404 OHTAMA Co., Ltd.
- 405 Energetiq Technology, Inc.
- 406 attocube systems Inc.
- 407 Corning Incorporated
- 409 XYALIS
- 411 Pozzetta, Inc.

Monterey Conference Center - Serra Ballroom

Tuesday 1 October 2024 10:00 AM-4:00 PM
 Wednesday 2 October 2024. 9:30 AM-4:00 PM

Booth numbers provided in the Exhibition Guide may be cross-referenced with the floor plan below. The address of each exhibitor is also listed, making this Exhibition Guide an excellent reference tool.



See full details and updates at spie.org/puv or on the **SPIE App**

EXHIBITOR LISTING

attocube systems Inc.

#406

SPIE. CORPORATE MEMBER

2115 Fourth St Ste B, Berkeley, CA, 94710-2260 USA
+1 510 649 9245
infoUSA@attocube.com; www.attocube.com

attocube offers cutting-edge components for nanoscale applications in research & industry. The business sector 'Cryogenic Instruments' includes nanopositioners, cryostats and microscopes for research in extreme environments, while 'Nanoscale Analytics' develops ultra-fast, high-resolution optical imaging and spectroscopy microscopes. With a strong focus on engineering applications, 'Motion & Sensing' offers high-precision motion and measuring devices for ambient and vacuum conditions. Contact: Vaden West, infoUSA@attocube.com

SPONSOR

Bruker

#104

430 S Congress Ave Ste 7, Delray Beach, FL, 33445-4701 USA
+1 561 330 0411; fax +1 561 330 0896
productinfo@bruker.com; www.bruker.comsemi

Canatu Oy

#403

Tiilenlyöjänkuja 9A, Vantaa, 01720 Finland
+358504422343
info@canatu.com; www.canatu.com

Featured Product: CNT membranes, EUV pellicles, debris filters, optical filters, X-ray filters

Canatu is the global leader in advanced carbon nanotubes and manufacturing equipment for the semiconductor industry. Our portfolio covers CNT membranes for EUV pellicles, debris filters, optical filters for EUV / X-ray, and CNT reactors. Canatu is uniquely positioned to meet the needs of the rapidly evolving semiconductor market with the world's thinnest and strongest CNT membranes made possible by our patented dry deposition process, reactors, and material. Contact: Samuli Kohonen, Chief Sales Officer, samuli.kohonen@canatu.com; Heikki Heinara, Chief Product Officer, heikki.heinara@canatu.com

SPONSOR

Carl Zeiss SMT GmbH

#303

Carl Zeiss Promenade 10, Jena, 07745 Germany
+49 3641 64 2563 ; fax +49 3641 64 2938
info.sms@zeiss.com; www.zeiss.com/mask-solutions

SPONSOR

Corning Incorporated

#407

SPIE. CORPORATE MEMBER

1 Riverfront Plz, Corning, NY, 14831-0001 USA
+1 607 974 9000; fax +1 607 974 8091
specialtymaterials@corning.com; https://www.corning.com/worldwide/en/products/advanced-optics.html

Solving the World's Toughest Optical Challenges with Innovation, Collaboration, and Precision. Corning's diverse advanced optics portfolio reflects our deep understanding of the properties of light, its interaction with matter, and the instruments used to detect it. For decades, we have been a trusted optics collaborator with leaders in a wide range of markets, including aerospace and defense, semiconductor materials and optics, telecommunications, and glass ceramics.

SPONSOR

Energetiq Technology, Inc.

#405

SPIE. CORPORATE MEMBER

205 Lowell St Ste 1A, Wilmington, MA, 01887-2972 USA
+1 781 939 0763; fax +1 781 939 0769
info@energetiq.com; www.energetiq.com

Featured Product: Broadband and EUV Light Sources

Energetiq designs, develops, and manufactures ultra-bright broadband light sources for complex scientific and engineering applications, including semiconductor manufacturing and life sciences analytical instruments. Energetiq light sources generate high brightness across the spectrum, from soft x-ray to infrared and beyond. Energetiq focuses on rapid development and on-time delivery of reliable, long-lasting products for volume production applications.

ESTION Technologies GmbH

#200

Im Duerren Kopf 38, Griesheim, 64347 Germany
+49 6155 88192 0; fax +49 6155 88192 18/19
contact@estion-tech.com; www.estion-tech.com

ESTION has more than 35 years of experience in electrostatic analyzing and problem solving in various industries concentrating on ESD, EOS, EFM and ESA related problems. Main focus is on cleanrooms, wafer front-end manufacturing, photomask and flat-panel manufacturing and handling (transmission and EUV), packaging and assembly. We develop, manufacture and sell in-situ electrostatic test equipm. mainly for the electronic industry. We offer training as well as certifying/optimizing of cleanrooms Contact: Thomas Sebal, President, thomas.sebal@estion-tech.com; Heike Mueller, Dir. Customer Care and Administration, heike.mueller@estion-tech.com

Gudeng, Inc.

#306

SPIE. CORPORATE MEMBER

4300 N Miller Rd Ste 110, Scottsdale, AZ, 85251-3638 USA
+1 886 222 6891 41
ellen.wu@gudeng.com; gudeng.com

Heidelberg Instruments Inc.

#304

SPIE. CORPORATE MEMBER

2539 W 237th St Ste A, Torrance, CA, 90505-5239 USA
+1 310 212 5071; fax +1 310 212 5254
sales@heidelberg-instruments.com; heidelberg-instruments.com

Featured Product: VPG 300 DI , VPG 200/400, DWL 66+

"Established in 1984, trusted in more than 50 countries with over 1,400 systems installed worldwide, Heidelberg Instruments is a global leader in design, development, and production of high-precision laser lithography systems, maskless aligners, and nanofabrication systems. Our tools range from tabletop solutions to high-end photomask manufacturing equipment and cater to a variety of needs. Our systems enable a broad spectrum of surface structuring on the micro- and nanoscale, including 2D-patte

HORIBA Instruments Inc.

#401

3740 Barron Way, Reno, NV, 89511-2388 USA
+1 775 250 8588
rosana.ramirez@horiba.com;
www.horiba.com/int/semiconductor

EXHIBITOR LISTING

ibss Group, Inc. #102

SPIE. CORPORATE MEMBER

111 Anza Blvd Ste 110, Burlingame, CA, 94010 USA
+1 650 513 1488; fax +1 650 513 1884
admin@ibssgroup.com; www.ibssgroup.com

JENOPTIK Optical Systems, LLC #203

SPIE. CORPORATE MEMBER

16490 Innovation Dr, Jupiter, FL, 33478-6449 USA
+1 561 881 7400
sales.us@jenoptik.com; www.jenoptik.us

Jenoptik Optical Systems is a globally operating photonics technology group which is present in more than 80 countries. Optical technologies are the very basis of our business. We design and build high-performance optical and micro optical lenses and systems leading semiconductor manufacturing equipment, medical diagnostic instruments, security and projection systems as well as internet communications technology. We are ISO 9001 and ISO 13485 certified as well as ITAR compliant. Contact: Ray Malcom, Sales Director, ray.malcom@jenoptik.com

Lintec of America Inc. #210

2900 E Plano Pkwy, Plano, TX, 75074-7475 USA
+1 214 812 9492; fax +1 214 812 9492
lintec-usa.com

Featured Product: cWeb™, Today's CNT Pellicle Film for Future High-Power EUV Lithography

LINTEC provides carbon nanotube-based films. Among these, the ultra-low density, ultra-thin, and self-supporting cWeb™ has high EUV transmission with selectable transmission rates from 92% to 98% and low transmission variation (<0.6%) in full-size. With randomly oriented CNTs and added features, cWeb provides unmatched mechanical strength and low EUV scattering for high-power EUV lithography. It sustains vacuum pressure variation, meets EUV pellicle requirements, and works with custom borders.

Mitsui Chemicals America, Inc. #202

101 Metro Dr, San Jose, CA, 95110-1314 USA
+1 408 453 0682; fax +1 408 453 0684
m.silverthorne@mitsuichem.com; us.mitsuichemicals.com

MSP, a Division of TSI #209

5910 Rice Creek Pkwy, Shoreview, MN, 55126-5025 USA
+1 651 287 8100; fax +1 651 287 8140
sales@mspcorp.com; tsi.com/msp

MSP, a Division of TSI®, offers specialized surface defect inspection solutions for photomask technology, including PRE Challenge Photomasks for Particle Removal Efficiency (PRE) testing. These photomasks are uniformly deposited with particle size standards, ensuring consistent and reliable testing of cleaning systems. This helps semiconductor manufacturers validate and optimize their cleaning processes, enhancing yield and minimizing defects.

Nano-Master, Inc. #205

4115 Freidrich Ln Ste 300, Austin, TX, 78744-1130 USA
+1 512 385 4552; fax +1 512 385 4900
main@nanomaster.com; www.nanomaster.com

NTT Advanced Technology Corp. #206

940 Stewart Dr, Sunnyvale, CA, 94085-3912 USA
+1 408 392 4280; fax +1 408 573 7721
bizdevelop.gbu@ml.ntt-at.co.jp; www.ntt-at.com

OHTAMA Co., Ltd. #404

SPIE. CORPORATE MEMBER

Adminsitration Dept., 2437-1, Noborito, Tama-ku, Kawasaki-shi, Kanagawa, 214-0014 Japan
+81 42 377 4311; fax +81 42 378 2219
t-fujii@ohtama.co.jp; www.ohtama.co.jp

Oxford Instruments Andor #207

SPIE. CORPORATE MEMBER

300 Baker Ave Ste 150, Concord, MA, 01742-2124 USA
+1 860 290 9211; fax +1 860 290 9566
marketing@andor.com; www.andor.com

Featured Product: OEM Solutions | sCMOS, CCD, EMCCD & SWIR Cameras | Spectroscopy Solutions

Andor is a global leader in the design and manufacture of high-performance scientific cameras and modular spectroscopy solutions for research and OEM markets. Our CCD and sCMOS cameras are used for direct and indirect detection of X-Ray, EUV, DUV, visible and SWIR wavelengths. Andor's spectroscopy solutions easily integrate into existing or new inspection and metrology platforms, incorporating analytical techniques such as Raman. Visit us to learn how Andor can enable your next market endeavor. Contact: Brad Rangell, OEM Sales Representative, b.rangell@andor.com; Craig Silverman, OEM Sales Manager, c.silverman@andor.com

Park Systems Inc. #402

3040 Olcott St, Santa Clara, CA, 95054-3207 USA
+1 408 986 1110; fax +1 408 986 1199
inquiry@parksystems.com; www.parksystems.com

Featured Product: Park NX-Mask

Park Systems is a world-leading manufacturer of atomic force microscopy (AFM) and nanometrology systems with a complete range of products for researchers and engineers in the chemistry, materials, physics, life sciences, semiconductor, and data storage industries. Its mission is to enable nanoscale advances for scientists and engineers to solve the world's most pressing problems and push the boundaries of scientific discoveries and engineering innovations.

SPONSOR

PLANSEE SE #307

Metallwerk-Plansee-Str 71, Reutte, 6600 Austria
+43 5672 600 0; fax +43 5672 600 500
info@plansee.com; www.plansee.com

Strong metals for strong products: Plansee is an expert in components made from molybdenum, tungsten, tantalum, and niobium. Whether in electronics, coating technology, or high-temperature furnaces, where regular metals reach their limits, the refractory metals, alloys, and composite materials from Plansee come into play. For more information visit our website www.plansee.com Contact: Christoph Adelhelm, Business Development Manager, christoph.adelhelm@plansee.com

POLLEN Metrology Inc.

#204

CO PRAMEX INTERNATIONAL, 1251 AVENUE OF THE AMERICAS FL 3, New York, NY, 10020 USA
+1 336 625 3778 9
johann.foucher@pollen-metrology.com;
www.pollen-metrology.com

Featured Product: Smart3 Software Suite to increase process control capabilities for IC Manufacturing

Pollen Metrology is a pioneer and a worldwide leader in Holistic AI-driven process control software for IC Manufacturing. Pollen is serving IC Makers & Foundries, Process tool suppliers and Metrology/Inspection Tool suppliers with a suite of Software solutions to increase process control capabilities from Lab to HVM and maximize high performance materials properties.

Pozzetta, Inc.

#411

SPIE. CORPORATE MEMBER

3121 S Platte River Dr, Englewood, CO, 80110-2139 USA
+1 303 783 3172; fax +1 303 374 7342
sales@pozzetta.com; www.pozzetta.com

Featured Product: Photomask Boxes, SMIF Pods, Pellicle Shippers, Custom Advanced Packaging

Pozzetta's signature products and systems transport, store, and protect, the semiconductor device fabrication industry's critical materials, semiconductor wafers, and photomasks. Contact: Artemis Vasiliades, Executive Vice President, artemis@pozzetta.com

Shin-Etsu MicroSi, Inc.

#100

SPIE. CORPORATE MEMBER

10028 S 51st St, Phoenix, AZ, 85044-5203 USA
+1 480 893 8898; fax +1 480 893 8637
marketing@microsi.com; www.microsi.com

SmarAct Inc.

#302

SPIE. CORPORATE MEMBER

2140 Shattuck Ave Ste 302, Berkeley, CA, 94704-1212 USA
+1 415 766 9006
info-us@smaract.com; www.smaract.com

Featured Product: TriPOD 400-6DoF

SmarAct develops high-performance piezo solutions for handling and positioning in the micro- and nanometer range. The broad product portfolio -from single stages to complex parallel kinematics, miniaturized robots and easy control systems- is completed by sophisticated measuring equipment based on powerful laser interferometers. We serve high-accuracy positioning and metrology applications in research and industry within such fields as optics, microassembly, semiconductors and life sciences.

Stratus Vision GmbH

#305

Benzstr. 28, Puchheim, 82178 Germany
+49 89 413 293 201
sales@stratusvision.com; www.stratusvision.com

Vistec Electron Beam GmbH

#208

SPIE. CORPORATE MEMBER

Ilmstr 4, Jena, 07743 Germany
+49 3641 799 80; fax +49 3641 7998 222
electron-beam@vistec-semi.com; www.vistec-semi.com

Featured Product: Vistec SB254 & Vistec SB3050-2

As a long-standing equipment supplier, Vistec Electron Beam GmbH, Jena (Germany) is providing leading technology solutions for advanced electron-beam lithography. Based on the Variable Shaped Beam (VSB) principle, the electron-beam lithography systems are mainly utilized for industrial & advanced research applications, such as electron-beam direct write in semiconductor manufacturing, including compound semiconductor, direct write mask making as well as photonics & several new emerging markets. Contact: Ines Stolberg, Manager Marketing & Sales, electron-beam@vistec-semi.com; John Whittey, Business Development Manager, electron-beam@vistec-semi.com

XYALIS

#409

5 Place Robert Schuman, Grenoble, 38000 France
+33 4 56 58 36 34; fax +33 476 282 849
info@xyalis.com; www.xyalis.com

Featured Product: 25 years of expertise in improving Mask Data Preparation productivity.

Time to update your Mask Data Preparation flow? XYALIS offers cutting-edge MDP solutions tailored to your workflow. Work with our customer oriented team to boost your MDP productivity through customized, production-proven engines that seamlessly integrate with your existing flow. From Multi-Project Wafer placement to frame generation and mask design, our high-speed trade specific engines work with open formats. Visit XYALIS at booth #409 to elevate your mask design efficiency. Contact: Eric Beisser, CEO, ebeisser@xyalis.com; Sylvie Hurat, US Area Manager, sylvie@xyalis.com

Moving technology to market - together.



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MLOPTIC
Modulight
MONOCROM
MONTFORT Laser
Moore
Nanotechnology
Systems
MPA Crystal
MPB
Communications
MPS Micro
Precision Systems
Myrias Optics
n2-Photonics
Naked Optics
Nanjing
Band-Optics
Technology
Nanjing Rising
Opto-Electronic
Nanomotion
nanoplus America
nanoplus
Nanosystems and
Technologies
Nanoscribe
nanosystec
NANOWORKS
Nanyang City
Jingliang Optical
Technology
National Aperture
National Institute
of Standards and
Technology
Natsume Optical
Navitar
Necsel
New Imaging
Technologies
New Scale
Technologies
New Source
Technology
Newport Corp.
Newport Spectra-
Physics
NexDome
Observatories
NextCorps
Nikon Metrology

NIL Technology
NKT Photonics
nLIGHT
NLM Photonics
NoIR InSight
NorPix
North American
Coating Labs.
Novanta
Novotech
NP Photonics
NTFL
NuFlare
Technology
NUVIEW
Nüvü Cameras
O/E Land
Obducat
Technologies
Obsidian Sensors
Ocean Optics
Octave Photonics
OEwaves
Officina Stellare
OFS
Ohara
OHTAMA
Omega Optical
Holdings
Omicron Laserage
Laserprodukte
Ontar Corporation
Optec
Optical Engines
Optical
Perspectives
Group
Optical Support
Optical Systems
Design
Opticology
OptiColor
Optics Technology
Optics Valley
OptiGrate - IPG
Photonics
Optikos
Optikron
Optimax Systems
OptiPro Systems
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poLight ASA
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Technology
PowerPhotonics
Pozzetta
Precision Glass &
Optics
Precision Optical
Precitech
Princeton Infrared
Technologies
Princeton
Scientific
Prior Scientific
Prizmatix
Prospective
Instruments
Pure Photonics
Pureon
PWY Service
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Engineering
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QDI Systems
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Intelligent
Technology
QuantCAD
Quartus
Engineering
Qunnect
QZabre
R Specialty
Optical Fibers
Radiant Vision
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Raicol Crystals
Rainbow
Research Optics
Raptor Photonics
Raysung
Photonics
Redondo Optics
RedWave Labs
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Technologies
Riverhawk
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RPMC Lasers
Ruda Optical
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Technology
Shanghai Crylink
Technology
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Store Optics
Shanghai Optics
Shanghai
PreciLasers
Technology
Sheaumann Laser
Shenzhen Solar
Valley SciTech
Development
Shenzhen Xinghan
Laser Technology
Shincron
Shin-Etsu MicroSi
SI Stuttgart
Instruments

SiCART (Zhuhai)
Technology
Sierra Precision
Optics
SILIOS
Technologies
Sill Optics
Siskiyou
Corporation
SmarAct
Somos IWT
son-x
Specim Spectral
Imaging
Spectrogon
Spectrogon UK
Spectrogon US
Spectrum
Scientific
Spica
Technologies
SPO Precision
Optics
SPU Optics
Stanford
Computer Optics
Sunny Optical
Technology
Sunny Technology
Super Conductor
Materials
Superlum Diodes
Surface Optics
Suzhou Everbright
Photonics
Svenska Laserf
riken
Swabian
Instruments USA
SWIR Vision
Systems
Sydor Optics
Synopsis
Syntec Optics
TAU Systems
Taylor Hobson
Technica Optical
Components
Technical
Manufacturing
Tecnisco
Tecport Optics
TelAztec
Teledyne
Telops

Tempotec Optics
TeraXion
The Aerospace
Corp.
The Institute of
Optics Univ. of
Rochester
Thermo Fisher
Scientific
Thin Film Service
ThinFilms
Thorlabs
Tibidabo
Scientific
Industries (USA)
TLC International
World
Headquarters
TOPTICA
Torrent Photonics
Tower Optical
Trilite
Technologies
TRIOPTICS
TRUMPF
TruTag
Technologies
Tucsen Photonics
Turning
Point Lasers
Corporation
TwinStar Optics
Coatings &
Crystals
Tydex
Umicore Optical
Materials USA
UNI Optics
Universal
Photonics
Vermont
Photonics
Technologies
Corp.
Vertilite
ViALUX
Video Scope
International
Video Systems
Videology
Industrial-Grade
Cameras
Vincent
Associates

Visimid
Technologies
Vital Optics
Technology
V-Optics SAS
Vortex Optical
Coatings
VORTRAN Laser
Technology
WaferChina
Walk Laser Optics
Wasatch
Photonics
Wavelength
Electronics
Wavelength Opto-
Electronic
Headquarters
WEINERT Fiber
Optics
WINHO Optical
Mfg.
World Star Tech
Wuhan Union
Optic
Wuxi Janhoo
Optoelectronics
Wyant College of
Optical Sciences
Wyse Light
WZW-Optic
Xcimer Energy
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Xinxin Gem
Technology Group
XONOX
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XPANCEO
Research on
Natural Science
Youopto
Technology
YSL Photonics
YSL Photonics
Z & Z
Optoelectronics
Zaber
Technologies
Zemax
Zhejiang Lante
Optics
Zhongshan Meisu
Technology
Z-Optics
Zygo



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Current list as of 7-16-2024

SPIE. AWARDS



20
24

SPIE GOLD MEDAL
AKHLESH LAKHTAKIA
Pennsylvania State University



20
24

SPIE PRESIDENT'S AWARD
KATIE SCHWERTZ
Edmund Optics



20
24

SPIE DIRECTORS' AWARD
HALINA RUBINSZTEIN-DUNLOP
The University of Queensland



20
24

**SPIE A.E. CONRADY AWARD
IN OPTICAL ENGINEERING**
THOMAS U. KAMPE
BAE Systems, Inc.



20
24

**SPIE CHANDRA S.
VIKRAM AWARD IN
OPTICAL METROLOGY**
ANAND ASUNDI
d'Optron Pte Ltd.



20
24

**SPIE DENNIS GABOR AWARD
IN DIFFRACTIVE OPTICS**
JUERGEN CZARSKA
*TUD Dresden University
of Technology*



20
24

**SPIE DIVERSITY
OUTREACH AWARD**
PREETI JAGADEV
Syracuse University



20
24

**SPIE FRITS ZERNIKE AWARD
FOR MICROLITHOGRAPHY**
RICHARD SANDSTROM
Cymer, Inc. (Retired)



20
24

**SPIE HARRISON H. BARRETT
AWARD IN MEDICAL IMAGING**
KYLE J. MYERS
Puente Solutions, LLC



20
24

**SPIE MARIA GOEPPERT
MAYER AWARD IN
PHOTONICS**
IAM-CHOON KHOO
Pennsylvania State University



20
24

**SPIE MARÍA J. YZUEL
EDUCATOR AWARD**
MARY G. TURNER
Edmund Optics



20
24

SPIE MAIMAN LASER AWARD
ANNE L'HUILLIER
Lund University

2024



2024

SPIE ADEN AND MARJORIE MEINEL TECHNOLOGY ACHIEVEMENT AWARD

M. SAIF ISLAM
University of California, Davis



2024

SPIE BIOPHOTONICS TECHNOLOGY INNOVATOR AWARD

JI-XIN CHENG
Boston University



2024

SPIE BRITTON CHANCE BIOMEDICAL OPTICS AWARD

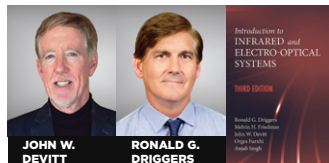
GERARD L. COTÉ
Texas A&M University



2024

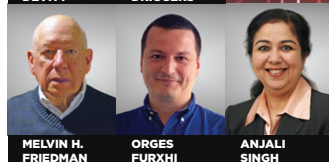
SPIE G.G. STOKES AWARD IN OPTICAL POLARIZATION

CURTIS R. MENYUK
University of Maryland, Baltimore County



JOHN W. DEVITT

RONALD G. DRIGGERS



MELVIN H. FRIEDMAN

ORGES FURXHI

ANJALI SINGH

JOSEPH W. GOODMAN BOOK WRITING AWARD

Introduction to Infrared and Electro-Optical Systems, Third Edition

2024



2024

SPIE HAROLD E. EDGERTON AWARD IN HIGH-SPEED OPTICS

CLARA SARACENO
Ruhr-Universität Bochum



2024

SPIE MOZI AWARD

ANDREA ALÙ
CUNY Advanced Science Research Center



2024

SPIE MOZI AWARD

TERI W. ODOM
Northwestern University



2024

SPIE RUDOLF AND HILDA KINGSLAKE AWARD IN OPTICAL DESIGN

DAVID SHAFER
David Shafer Optical Design

SPIE AWARDS COMMITTEE

A special thanks to our committee members who devoted many hours in selecting this year's winners.

Samuel Achilefu
(Committee Chair)

Nicholas Antipa

Tara Fortier

Arthur Gmitro

Viktor Gruev

Nathan Hagen

Harry Levinson

Carmiña Londoño

Shouleh Nikzad

Richard Pfisterer

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Joanna Schmit

Tsu-Te Judith Su

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SPIE has established a confidential reporting system for all SPIE event participants to raise concerns about possible unethical or inappropriate behavior within our community. When at an SPIE event, you may contact any SPIE staff with concerns. If you feel that you are in immediate danger, please dial the local emergency number for police intervention.

Agreement to hold harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Be well agreement

You acknowledge that attending an event involves some risk of exposure to COVID-19 or other communicable diseases. You voluntarily assume this risk and agree not to hold SPIE or any of its affiliates liable for any illness you may contract. You also agree not to attend the event if you feel ill or have had recent exposure to a COVID-19 case.

SPIE will provide hand sanitizer locations and disposable face masks upon request.

Anti-harassment policy

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated. This policy applies to all locations and situations where SPIE business is conducted and to all SPIE-sponsored activities and events.

Read complete policy:
<https://spie.org/about-spie/the-society/policies-and-reporting>

SPIE Conferences app messaging policy

The SPIE Conferences app supports attendee-to-attendee messaging to facilitate professional networking among meeting participants. This feature should not be used to push high-volume solicitations, and messaging will be disabled for attendees who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use via the app reporting feature. SPIE will also monitor for high-volume patterns suggesting improper use.

SPIE Conferences app connect feature

The connect feature in the SPIE Conferences app is a personal networking tool that allows individuals to share their contact information with other attendees via their phones while using the SPIE app. This tool should not be used for systematic scanning of badges for managing sales leads. Inappropriate use is a violation of event policy.

SPIE Conferences app lead retrieval feature

The lead retrieval feature in the SPIE Conferences app is a lead generation tool that allows attendees to share their contact information with SPIE exhibitors. Exhibitor representatives using the lead retrieval app may scan attendee badges in the exhibition or supporting company events after receiving permission from an attendee. It should not be used in the technical conference area. The lead retrieval feature will be disabled for exhibitor representatives who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use by notifying staff or contacting support via the help link in the app.

Attendee registration and admission policies

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry of or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Capture and use of a person's image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness, including incidental capture of any individuals in your household or workplace, by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE purpose. By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify, and hold harmless SPIE from and against any claims, damages, or liability arising from or related to the use of the images, recordings, or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion, or use in composite form that may occur or be produced in taking, processing, reduction, or production of the finished product, its publication or distribution.

Code of conduct

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

Read complete code:
<https://spie.org/about-spie/the-society/policies-and-reporting>

Event and course cancellation by SPIE

If for some unforeseen reason, SPIE should have to cancel a course or an entire event, processed registration fees for the canceled activity will be refunded to registrants. Registrants will be responsible for the cancellation of travel arrangements or housing reservations and the applicable fees.

Family-friendly policy

CONFERENCE EVENTS: all conference technical and networking events require a badge for admission. Registered attendees may bring children with them if they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

EXHIBITION HALL: everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

Identification requirement

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials. Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

For online events, SPIE requires individuals to register with their legal identity.

Laser-pointer safety policy

SPIE events are subject to the applicable laser safety rules and regulations of the host location. SPIE supplies industry-standard Class 2 presentation laser pointers for all conference and other meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers. The use of a personal laser pointer represents the user's acceptance of liability for any damage or injuries to the presenter or others.

No smoking policy

Attendees will observe all non-smoking regulations that are publicly posted by the facilities used by the event.

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SPIE Journals

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Online commenting policy

SPIE moderates all comments posted in an online event. We encourage robust discussion, the exchange of scientific ideas, and the sharing of multiple, diverse perspectives. We expect the discussion to be consistent with the norms of scholarly research community interactions at events. Online event participants should report any comments or content that falls short of those community norms. We will remove comments, content, or people that are considered inappropriate by SPIE standards or that:

- are defamatory, libelous, obscene, indecent, abusive, or threatening to others
- infringe the copyright, trademark, or other rights of a third party
- upload viruses or are a cybersecurity hazard
- are off-topic or inappropriately commercial in nature
- are in violation of any applicable laws or regulations

Payment policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks, and wire transfers. Onsite registrations can also be paid with cash.

Recording policy

CONFERENCES AND POSTER SESSIONS: audio and video recordings are prohibited without prior written consent of SPIE and the presenter. Consent forms are available at Speaker Check-in, SPIE Registration, or the Chair Services Desk. Individuals not complying with this policy will be asked to surrender their recording media and leave the conference room. Refusal to comply with such requests is grounds for expulsion from the event. Please see the SPIE code of conduct.

COURSES: audio and video recordings are prohibited without explicit permission from SPIE and the instructor. Individuals not complying with this policy will be asked to surrender their recording media and leave the classroom. Refusal to comply with such requests is grounds for expulsion from the event.

EXHIBITION: attendees may not record interviews on the exhibition floor nor record or photograph exhibitor booth displays and/or products without explicit permission from SPIE and on-site company representatives. Consent forms are available at Exhibitor Assistance. Individuals not complying with this policy will be asked to surrender their recording media and leave the exhibition hall. Refusal to comply with such requests is grounds for expulsion from the event.

Unauthorized solicitation

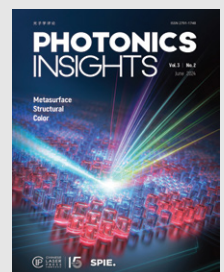
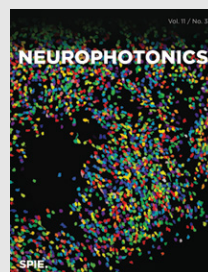
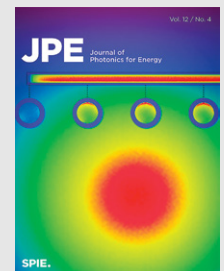
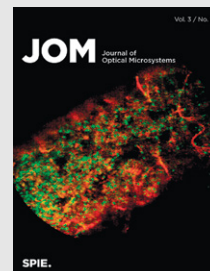
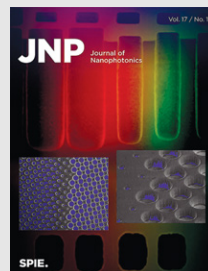
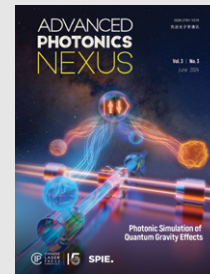
Unauthorized solicitation in the exhibition hall is prohibited. Any non-exhibiting organization observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Unsecured items

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless internet service

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other kinds of computer damage.



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