

SPIE. SCANNING
MICROSCOPIES



SCANNING MICROSCOPIES TECHNICAL PROGRAM.

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CO-LOCATED WITH
SPIE PHOTOMASK
TECHNOLOGY 2015.

Conferences: 29 September–1 October 2015

Exhibition: 29–30 September 2015

Monterey Conference Center and Monterey Marriott

Monterey, California, USA



SPIE. SCANNING MICROSCOPES



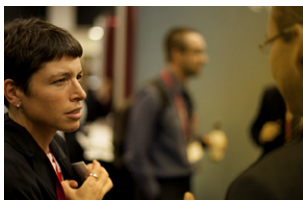
Conferences: 29 September–1 October 2015

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Monterey, California, USA

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SYMPOSIUM CHAIRS



Michael T. Postek
National
Institute of
Standards and
Technology



Dale E. Newbury
National
Institute of
Standards and
Technology



S. Frank Platek
U.S. Food
and Drug
Administration



Tim K. Maugel
Univ. of
Maryland,
College Park



Keynote Presentation

Tuesday 29 September 2015 · 8:20 to 9:00 am

Location: Steinbeck Forum



Lithography and Mask Challenges at the Leading Edge

Harry J. Levinson

Senior Director, GLOBALFOUNDRIES Inc.

Continued scaling using multiple patterning is resulting in large increases in mask counts. Mask defect inspection times are increasing much faster than write times. Pushing optical lithography to its limits necessitates exceedingly tight mask-making process control. The use of EUV lithography introduces many new technical challenges associated with a mask architecture very different from optical masks. Because of higher resolution, smaller defects and LER at higher spatial frequencies print with EUV lithography than with optical lithography.

Dr. Levinson spent most of his career working in the field of lithography, starting at AMD. He then spent some time at Sierra Semiconductor and IBM before returning to AMD – now GLOBALFOUNDRIES – in 1994. During the course of his career, Dr. Levinson has applied lithography to many different technologies, including bipolar memories, 64Mb and 256Mb DRAM development, the manufacturing of applications-specific integrated circuits, thin film heads for magnetic recording, flash memories and advanced logic. He was one of the first users of 5x steppers in Silicon Valley and was an early participant in 248 nm and 193 nm lithography.

SPECIAL EVENTS

Tuesday 29 September.

Tuesday Lunch

12:30 to 2:00 pm · Location: Marriott, San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday.

Tickets are NOT included with Scanning registration but can be purchased onsite at the registration desk.

Poster Viewing

10:00 am to 4:00 pm and 6:00 to 7:30 pm

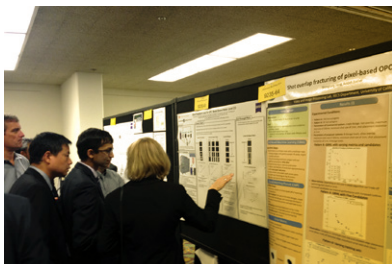
Location: Exhibition Hall, Serra Grand Ballroom

Poster authors may set up their poster papers between 10:00 am and 4:00 pm on Tuesday and will leave them up until Wednesday afternoon. Authors will be present during the Poster Reception 6:00 to 7:30 pm Tuesday to answer questions and provide in-depth discussion regarding their papers.

Poster/Exhibition Reception

6:00 to 7:30 pm · Location: Exhibition Hall, Serra Grand Ballroom

Symposium attendees are invited to attend the Poster/Exhibition Reception on Tuesday evening in the Serra Grand Ballroom. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers and interact with the authors, and visit the exhibition. Refreshments will be served.



Attendees are requested to wear their conference registration badges.

SPECIAL EVENTS

Wednesday 30 September.

Poster Viewing

10:00 am to 3:00 pm

Location: Exhibition Hall, Serra Grand Ballroom

Poster authors may set up their poster papers between 10:00 am and 4:00 pm on Tuesday and will leave them up until Wednesday afternoon. Authors will be present during the Poster Reception 6:00 to 7:30 pm Tuesday to answer questions and provide in-depth discussion regarding their papers.

Wednesday Lunch

12:00 to 1:30 pm · Location: Marriott, San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday.

Tickets are NOT included with Scanning registration but can be purchased onsite at the registration desk.

STEM WORKSHOP

Science, Technology, Engineering, and Mathematics (STEM) Open Laboratory

4:30 pm to 5:30 pm · Location: Conv. Ctr. Colton

Workshop Chairs: **Michael T. Postek**, National Institute of Standards and Technology; **Robert J. Gordon**, Hayashi High Technologies America, Inc.

Photomask Reception

Don't Miss the Photomask Reception

6:00 to 8:00 pm · Marriott, San Carlos Ballroom

Tickets may be purchased onsite (we highly recommend purchasing in advance to assure your reservation).

Make plans to join your colleagues and friends at the annual Photomask Reception. This year's event focuses on good food, beverages, and plenty of time to socialize or talk business with fellow conference attendees. Awards, entertainment, and other presentations will be included in the evening.



BEER/WINE SPONSOR

HOYA

Thursday 1 October.

Thursday Lunch

12:30 to 2:00 pm · Location: Marriott, San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday.

Tickets are NOT included with Scanning registration but can be purchased onsite at the registration desk.



**Light-based technologies respond
to the needs of humankind**

Join us in celebrating the International Year of Light

The International Year of Light is a global initiative highlighting to the citizens of the world the importance of light and light-based technologies in their lives, for their futures, and for the development of society.

We hope that the International Year of Light will increase global awareness of the central role of light in human activities and that the brightest young minds continue to be attracted to careers in this field.

For more information on how you and your organization can participate, visit www.spie.org/IYL



INTERNATIONAL
YEAR OF LIGHT
2015



SPIE.

E.

EXHIBITION



The SPIE Photomask Technology Exhibition, the mask-making industry's premier event.

Tuesday 29 September
10:00 am to 4:00 pm

Wednesday 30 September
10:00 am to 4:00 pm



**WALK THE FLOOR TO
MEET KEY SUPPLIERS.**

**STAY UP TO DATE ON
INDUSTRY TRENDS.
SEE THE LATEST IN:**

- Mask Making
- Mask Application
- Emerging Mask Technologies
- Mask Business

THANKS TO THIS YEAR'S CONTRIBUTING SPONSORS

ADVANTEST



ASML

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HOYA



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SCANNING MICROSCOPIES DAILY EVENT SCHEDULE

TUESDAY 29 September	WEDNESDAY 30 September	THURSDAY 1 October
MORNING SESSIONS		
Opening Remarks and Award Presentation, Session Chairs: Naoya Hayashi, Bryan S. Kasprowicz, Michael T. Postek, 8:15 to 8:20 am		
KEYNOTE SESSION 8:20 to 9:00 am KEYNOTE PRESENTATION Lithography and Mask Challenges at the Leading Edge, Harry J. Levinson	SESSION 5: Scanning Beam Technologies and Applications: Joint Session with Photomask and Scanning Microscopies 8:30 to 10:10 am, (Session Chairs: Michael T. Postek, Jan Hendrik Peters)	SESSION 8: Advancements in Atomic Force Microscopy I, 8:30 to 10:00 am (Session Chairs: Ronald G. Dixon, Lynne Gignac)
SESSION 1: Invited Session: Joint Session with Photomask and Scanning Microscopies, 9:00 to 10:30 am		
COFFEE BREAK, 10:30 to 11:00 am	COFFEE BREAK, 10:10 to 10:40 am	COFFEE BREAK, 10:00 to 10:30 am
SESSION 2: Advances in Optical and Particle Beam Microscopies I, 11:00 am to 12:00 pm (Session Chairs: Dale E. Newbury, Lucille A. Giannuzz)	SESSION 6: Advancements in Microscopy for Forensic Science, 10:40 am to 12:30 pm (Session Chairs: S. Frank Platek, Michael C. McVicker)	SESSION 9: Advancements in Atomic Force Microscopy II, 10:30 to 11:20 am (Session Chairs: Lynne Gignac, Ronald G. Dixon)
		SESSION 10: Advancements in X-Ray Microanalysis, 11:20 am to 12:10 pm (Session Chairs: Dale E. Newbury, S. Frank Platek)

 = Co-located Sessions with SPIE Photomask 2015.

TUESDAY 29 September	WEDNESDAY 30 September	THURSDAY 1 October
LUNCH · Buffet lunches are served Tuesday - 12:00 to 1:30 pm, Thursday - 12:30 to 2:00 pm, and Wednesday - 12:00 to 1:30 pm. Tickets may be purchased at the SPIE registration desk onsite.		
AFTERNOON SESSIONS		
SESSION 3: Advancements in Optical and Particle Beam Microscopies II , 1:30 to 3:20 pm (Session Chairs: Lucille A. Giannuzzi, András E. Vladár)	SESSION 7: Microscopy for Science, Technology, Engineering, and Mathematics (STEM) , 2:00 to 4:30 pm (Session Chairs: Robert Gordon, Michael T. Postek)	
COFFEE BREAK , 3:20 to 3:50 pm	COFFEE BREAK , 3:00 to 3:30 pm	
SESSION 4: Advancements in Optical and Particle Beam Microscopies III , 3:50 to 5:10 pm (Session Chairs: András E. Vladár, Lucille A. Giannuzzi)	STEM WORKSHOP: Science, Technology, Engineering, and Mathematics (STEM) Open Laboratory , 4:30 to 5:30 pm (Workshop Chairs: Michael T. Postek, Robert J. Gordon)	
EXHIBITION · 10:00 am TO 4:00 pm		
POSTER/EXHIBITION RECEPTION 6:00 to 7:30 pm	PHOTOMASK RECEPTION 6:00 to 8:00 pm <i>Tickets are not included with Scanning registration. Tickets can be purchased onsite.</i>	



DOWNLOAD THE SPIE CONFERENCE APP



CONFERENCE 9636

Tuesday–Thursday 29 September–1 October 2015
Proceedings of SPIE Vol. 9636

Scanning Microscopies 2015

Conference Chairs: **Michael T. Postek**, National Institute of Standards and Technology (USA); **Dale E. Newbury**, National Institute of Standards and Technology (USA); **S. Frank Platek**, U.S. Food and Drug Administration (USA); **Tim K. Maugel**, Univ. of Maryland, College Park (USA)

Program Committee: **Eva M. Campo**, Bangor Univ. (United Kingdom); **Petr Cizmar**, Physikalisch-Technische Bundesanstalt (Germany); **Ronald G. Dixon**, National Institute of Standards and Technology (USA); **Raynald Gauvin**, McGill Univ. (Canada); **Lynne M. Gignac**, IBM Thomas J. Watson Research Ctr. (USA); **Robert Gordon**, Hitachi High Technologies America, Inc. (USA); **Michael J. McVicar**, Ctr. of Forensic Sciences (Canada); **John S. Villarrubia**, National Institute of Standards and Technology (USA); **András E. Vladár**, National Institute of Standards and Technology (USA); **Lucille A. Giannuzzi**, L.A. Giannuzzi & Associates LLC (USA)

LOCATION: STEINBECK FORUM

TUESDAY 29 SEPTEMBER

OPENING REMARKS AND AWARD PRESENTATION

Location: Steinbeck Forum 8:15 am to 8:20 am

Session Chairs: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. (Japan);
Bryan S. Kasprovicz, Photonics, Inc. (USA)



2015 BACUS Scholarship Award

Presented to

Yow-Gwo (Henry) Wang
Univ. of California at Berkeley

KEYNOTE SESSION

Location: Steinbeck Forum Tue 8:20 am to 9:00 am

Session Chairs: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. (Japan);
Bryan S. Kasprovicz, Photonics, Inc. (USA)



Lithography and Mask Challenges at the Leading Edge

Harry J. Levinson, Senior Director
GLOBALFOUNDRIES Inc.

CONFERENCE 9636

SESSION 1

Location: Steinbeck Forum Tue 9:00 am to 10:30 am

Invited Session

Joint with Photomask and Scanning Microscopies

Session Chairs: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. (Japan); **Bryan S. Kasprovicz**, Photonics, Inc. (USA); **Michael T. Postek**, National Institute of Standards and Technology (USA)

9:00 am: **EUV lithography scanner and mask optimization for sub-8nm resolution** (*Invited Paper*), Jan van Schoot, Koen van Ingen Schenau, Kars Troost, ASML Netherlands B.V. (Netherlands); John D. Zimmerman, ASML (USA); Sascha Migura, Jens Timo Neumann, Bernhard Kneer, Winfried Kaiser, Carl Zeiss SMT GmbH (Germany) [9635-2]

9:30 am: **Advances in FIB ex situ lift out specimen preparation** (*Invited Paper*), Lucille A. Giannuzzi, EXpressLO LLC (USA) [9636-2]

10:00 am: **How to make EUV work!** (*Invited Paper*), Hermann Gerlinger, Carl Zeiss SMT GmbH (Germany) [9635-3]

Coffee Break Tue 10:30 am to 11:00 am

SESSION 2

Room: Colton Tue 11:00 am to 12:00 pm

Advances in Optical and Particle Beam Microscopies I

Session Chairs: **Dale E. Newbury**, National Institute of Standards and Technology (USA); **Lucille A. Giannuzzi**, L.A. Giannuzzi & Associates LLC (USA)

11:00 am: **Fundamental comparison of electron imaging modes for dimensional metrology** (*Invited Paper*), Michael T. Postek, John S. Villarrubia, András E. Vladár, National Institute of Standards and Technology (USA); Atsushi Muto, Hitachi High Technologies America, Inc. (USA) [9636-32]

11:30 am: **Status of accurate three-dimensional SEM measurements at the nanometer scale** (*Invited Paper*), András E. Vladár, Vipin Tondare, John S. Villarrubia, Michael T. Postek, National Institute of Standards and Technology (USA) [9636-3]

Lunch/Exhibition Break Tue 12:00 pm to 1:30 pm

SESSION 3

Room: Colton Tue 1:30 pm to 3:20 pm

Advancements in Optical and Particle Beam Microscopies II

Session Chairs: **Lucille A. Giannuzzi**,
L.A. Giannuzzi & Associates LLC (USA);

András E. Vladár, National Institute of Standards and Technology (USA)

1:30 pm: **Does your SEM really tell the truth? How would you know?**

Part 4: Charging and its mitigation (*Invited Paper*), Michael T. Postek,
András E. Vladár, National Institute of Standards and Technology
(USA) [9636-4]

2:00 pm: **Three-dimensional characterization of Gd nanoparticles using STEM-in-SEM tomography in a dual-beam FIB-SEM** (*Invited Paper*),
Brandon Van Leer, Cedric Bouchet-Marquis, Huikai Cheng, FEI Co.
(USA) [9636-5]

2:30 pm: **A novel approach to TEM preparation with a (7-axis stage) triple-beam FIB-SEM system** (*Invited Paper*), Jamil J. Clarke,
Hitachi High Technologies America, Inc. (USA) [9636-6]

3:00 pm: **Molecular dynamics study of crystalline orientation effect in scanning ion microscopes**, Kaoru Ohya, The Univ. of Tokushima
(Japan) [9636-7]

Coffee Break Tue 3:20 pm to 3:50 pm

CONFERENCE 9636

SESSION 4

Room: Colton Tue 3:50 pm to 5:10 pm

Advancements in Optical and Particle Beam Microscopies III

Session Chairs: **András E. Vladár**,
National Institute of Standards and Technology (USA);
Lucille A. Giannuzzi, L.A. Giannuzzi & Associates LLC (USA)

3:50 pm: **Correlative microscopy including CLSM and SEM to improve high-speed, high-resolution laser-engraved print and embossing forms**, Markus Bohrer, Dr. Bohrer Lasertec GmbH (Austria); Michael Schweitzer, Carl Zeiss SMT GmbH (Austria); Robert Nirmberger, Carl Zeiss GmbH (Austria); Bernhard Weinberger, Dr. Bohrer Lasertec GmbH (Austria) [9636-8]

4:10 pm: **Sub-diffraction-limit imaging using mode multiplexing**, Nan Wang, Jinping He, Jun Miyazaki, The Univ. of Electro-Communications (Japan); Hiromichi Tsurui, Juntendo Univ. (Japan); Takayoshi Kobayashi, The Univ. of Electro-Communications (Japan) [9636-9]

4:30 pm: **Investigation of electron beam irradiation effect on pore formation**, Seong Soo Choi, Myoung Jin Park, Chul Hee Han, Sun Moon Univ. (Korea, Republic of); Sung In Kim, Jung Ho Yoo, Kyung Jin Park, National Nanofab Ctr. (Korea, Republic of); Nam Kyou Park, Seoul National Univ. (Korea, Republic of); Yong-Sang Kim, SungKyunKwan University (Korea, Republic of) [9636-10]

4:50 pm: **Investigation of all-optical micro- and nanolithography by electric field intensity gradient**, Ugis Gertners, Zanda Gertnere, Janis Teteris, Univ. of Latvia (Latvia) [9636-11]

WEDNESDAY 30 SEPTEMBER

SESSION 5

Room: Steinbeck Forum Wed 8:30 am to 10:10 am

Scanning Beam Technologies and Applications

Joint Session with Photomask and Scanning Microscopies

Session Chairs: **Michael T. Postek**, National Institute of Standards and Technology (USA); **Jan Hendrik Peters**, Carl Zeiss SMS GmbH (Germany)

8:30 am: **Very-high energy (300-400 keV) SEM imaging of Cu interconnects** (*Invited Paper*), Lynne Gignac, Christopher M. Breslin, Jemima Gonsalves, Franco Stellari, Chung-Ching Lin, IBM Thomas J. Watson Research Ctr. (USA) [9636-12]

9:00 am: **Quantitative analysis of CD error induced by the fogging effect in e-beam lithography**, Shao-Wen Chang, Tzu-Yi Wang, Ta Cheng Lien, Chia-Jen Chen, Chih-Cheng Lin, Shin-Chang Lee, Anthony Yen, Taiwan Semiconductor Manufacturing Co. Ltd. (Taiwan) [9635-72]

9:30 am: **Application of gas field ion source to photomask repairs** (*Invited Paper*), Fumio Aramaki, Tomokazu Kozakai, Osamu Matsuda, Hiroshi Oba, Yasuhiko Sugiyama, Kazuo Aita, Anto Yasaka, Hitachi High-Tech Science Corp. (Japan) [9636-13]

9:50 am: **The reparability of various pattern and material for 10nm lithography mask and beyond**, Shingo Yoshikawa, Takeshi Kosuge, Takao Nishiguchi, Koichi Kanno, Hidemichi Imai, Masaaki Kurihara, Hiroyuki Miyashita, Naoya Hayashi, Dai Nippon Printing Co., Ltd. (Japan) . [9635-19]

Coffee Break Wed 10:10 am to 10:40 am

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SESSION 6

Room: ColtonWed 10:40 am to 12:30 pm

Advancements in Microscopy for Forensic Science

Session Chairs: **S. Frank Platek**, U.S. Food and Drug Administration (USA);
Michael C. McVicker, U.S. Marine Corps (USA)

10:40 am: **A compilation of cold cases using scanning electron microscopy at the University of Rhode Island**, Michael J. Platek, Otto J. Gregory, The Univ. of Rhode Island (USA) [9636-14]

11:00 am: **SEM/EDS analysis for problem solving in the food industry**, Wayne D. Niemeyer, McCrone Associates, Inc. (USA) [9636-15]

11:20 am: **Observations on the variability in deposition and recovery of gunshot residue particles for fabric targets within 10 meters of a discharged firearm**, Andrew Wolf, Ctr. of Forensic Sciences (Canada); Victoria Del Plavignano, Univ. of Ontario Institute of Technology (Canada) [9636-16]

11:40 am: **Exploration of 2D-mXRF analysis of gunshot residue from cartridge cases and around bullet holes**, Martin Janssen, Netherlands Forensic Institute (Netherlands)..... [9636-17]

12:00 pm: **The use of commercial reference materials including the NIST Reference Manual (RM) 8820 SEM Artifact for SEM Calibrations in Forensic Laboratories (Invited Paper)**, S. Frank Platek, U.S. Food and Drug Administration (USA); Michael T. Postek, András E. Vladár, National Institute of Standards and Technology (USA); Stefanie L. Heckman, U.S. Food and Drug Administration (USA) [9636-18]

Lunch/Exhibition BreakWed 12:30 pm to 2:00 pm

SESSION 7

Room: ColtonWed 2:00 pm to 4:30 pm

**Microscopy for Science, Technology,
Engineering, and Mathematics (STEM)**

Session Chairs: **Robert Gordon**, Hitachi High Technologies America, Inc. (USA); **Michael T. Postek**, National Institute of Standards and Technology (USA)

2:00 pm: **There's an electron microscope on that bus?! (Invited Paper)**, Sarah Weisberg, Cell Motion Labs. (USA); Ben Dubin-Thaler, Cell Motion Labs. (USA); Robert Gordon, Hitachi High Technologies America, Inc. (USA) [9636-19]

2:30 pm: **Hitachi TM3030 engages at the nexus of cross-curriculum teaching and vertical articulation (Invited Paper)**, Dave E. Menshew, James C. Enochs High School and Brandman Univ. (USA) [9636-20]

Coffee BreakWed 3:00 pm to 3:30 pm

3:30 pm: **Using a university characterization facility to educate the public about microscopes: light microscopes to SEM (Invited Paper)**, Nancy Healy, Walter Henderson, Georgia Institute of Technology (USA) [9636-21]

4:00 pm: **How a lesson on microscopes supports learning about light in elementary schools (Invited Paper)**, Joyce Allen, Nancy Healy, Georgia Institute of Technology (USA) [9636-22]

STEM WORKSHOP

Room: Colton 4:30 pm to 5:30 pm

**Science, Technology, Engineering, and
Mathematics (STEM) Open Laboratory**

Workshop Chairs:

Michael T. Postek, National Institute of Standards and Technology;
Robert J. Gordon, Hayashi High Technologies America, Inc.

CONFERENCE 9636

THURSDAY 1 OCTOBER

SESSION 8

Room: Colton Thu 8:30 am to 10:00 am

Advancements in Atomic Force Microscopy I

Session Chairs: **Ronald G. Dixon**,
National Institute of Standards and Technology (USA);
Lynne Gignac, IBM Thomas J. Watson Research Ctr. (USA)

8:30 am: **Continuous monitoring of tip radius during atomic force microscopy imaging** (*Invited Paper*), Jordi Fraxedas, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); Francesc Pérez-Murano, Ctr. Nacional de Microelectrónica (Spain); Federico Gramazio, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); Matteo Lorenzoni, Ctr. Nacional de Microelectrónica (Spain); Enrique Rull Trinidad, Urs Staufer, Technische Univ. Delft (Netherlands) [9636-23]

9:00 am: **Correlated nanoparticle height and width measurements in atomic force microscopy** (*Invited Paper*), Natalia Farkas, John A. Dagata, National Institute of Standards and Technology (USA) [9636-24]

9:30 am: **Lateral tip control effects in CD-AFM metrology: The large tip limit** (*Invited Paper*), Ronald G. Dixon, National Institute of Standards and Technology (USA) [9636-25]

Coffee Break Thu 10:00 am to 10:30 am

SESSION 9

Room: Colton Thu 10:30 am to 11:20 am

Advancements in Atomic Force Microscopy II

Session Chairs: **Lynne Gignac**,

IBM Thomas J. Watson Research Ctr. (USA);

Ronald G. Dixon, National Institute of Standards and Technology (USA)

10:30 am: **SPM metrological assurance using a heterodyne interferometer**, Tatiana Kazieva, NRNU MEPhI (Russian Federation); Andrey P. Kuznetsov, Konstantin L. Gubskiy, Vladimir N. Reshetov, National Research Nuclear Univ. MEPhI (Russian Federation); Maria Ponarina, NRNU MEPhI (Russian Federation); Andrey Antonov, LaserEye LLC (Russian Federation); Alexey Useinov, TISNUM (Russian Federation) [9636-26]

10:50 am: **Initial results of photomask linewidth comparison by PTB and NIST** (*Invited Paper*), Detlef Bergmann, Bernd Bodermann, Harald Bosse, Egbert Buhr, Gaoliang Dai, Physikalisch-Technische Bundesanstalt (Germany); Ronald G. Dixon, National Institute of Standards and Technology (USA); Wolfgang Hässler-Grohne, Kai Hahm, Matthias Wurm, Physikalisch-Technische Bundesanstalt (Germany) [9636-28]

SESSION 10

Room: Colton Thu 11:20 am to 12:10 pm

Advancements in X-Ray Microanalysis

Session Chairs: **Dale E. Newbury**,

National Institute of Standards and Technology (USA);

S. Frank Patek, U.S. Food and Drug Administration (USA)

11:20 am: **Electron-excited energy dispersive x-ray spectrometry in the variable pressure scanning electron microscope: it's not microanalysis anymore!** (*Invited Paper*), Dale E. Newbury, Nicholas W. M. Ritchie, National Institute of Standards and Technology (USA) [9636-29]

11:50 am: **Development of "water window" laser generated plasma soft X-ray source for contact microscopy experiments**, Mesfin G. Ayele, Daniel Adjei, Joanna Czwartos, Przemyslaw W. Wachulak, Andrzej S. Bartnik, Henryk Fiedorowicz, Military Univ. of Technology (Poland) [9636-30]

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ONLINE PROCEEDINGS

Paid meeting registration includes online access to all 2015 SPIE Scanning Microscopies proceedings via the SPIE Digital Library. See below for details.

Access will be ongoing using your SPIE login credentials. Attendees will have online access to all proceedings papers related to this event as they are published; expected publication date is 31 October 2015. Papers can be accessed online through the SPIE Digital Library, and all downloaded PDFs of papers are yours to keep.

To access the proceedings:

- If you already have an SPIE account, sign in at www.spiedigitallibrary.org (click SIGN IN, upper right corner) to gain access to the conference papers. If you do not have an account, create one using the email address you used

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Product Code: **DLC587**

Included Volumes: 9635, 9636

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- Once you have signed in, use the Browse Proceedings By Conference link and scroll to the Photomask Technology conference.

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Should you need any assistance, please contact us at:

Email: SPIEDLsupport@spie.org

Phone (North America):

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PRINTED PROCEEDINGS

You can purchase printed proceedings for an additional fee. Printed proceedings will be available 8-10 weeks after the conference. Shipping is additional.

VOL#	TITLE (EDITOR)	PRICE
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	<i>(Michael T. Postek, Dale E. Newbury, S. Frank Platek, Tim K. Maugel)</i>	
9635	Photomask Technology 2015	\$100
	<i>(Naoya Hayashi, Bryan S. Kasprovicz)</i>	

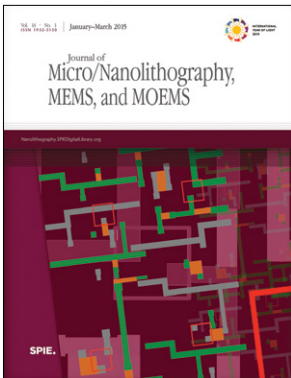


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GENERAL INFORMATION



REGISTRATION

Onsite Registration and Badge Pick-Up Hours

Portola Lobby

Monday 28 September	12:00 pm to 5:00 pm
Tuesday 29 September	7:15 am to 4:00 pm
Wednesday 30 September	7:30 am to 4:00 pm
Thursday 1 October	8:00 am to 10:30 am

SCANNING MICROSCOPIES REGISTRATION

Includes admission to all conference sessions, Keynote, Panel Discussion, Poster Reception, admission to the Exhibition, morning breakfast breads, coffee breaks, afternoon dessert snacks, and online proceedings. This does not include Photomask Reception or Lunches. Student pricing does not include proceedings, lunches, or Photomask Reception. Tickets can be purchased when you preregister or onsite.

EXHIBITION REGISTRATION

Exhibition-Only visitor registration is complimentary.

SPIE MEMBER, SPIE STUDENT MEMBER, AND STUDENT PRICING

- SPIE Members receive conference and course registration discounts. Discounts are applied at the time of registration.
- SPIE Student Members receive a 50% discount on all courses.
- Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

PRESS REGISTRATION

For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

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Registration Area

Open during registration hours

Registration Payments

If you are paying by cash or check as part of your onsite registration, wish to add a special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier.

Receipts and Certificate of Attendance

Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

Badge Corrections

Badge corrections can be made by the SPIE Cashier. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

Refund Information

There is a \$50 service charge for processing refunds. Requests for refunds must be received by 17 September 2015; all registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions or Special Events purchased are not refundable.

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U.S. Government credit card users: have your purchasing officer contact the credit card company and get prior authorization before attempting to register. Advise your purchasing agent that SPIE is considered a 5968 company for authorization purposes.

GENERAL INFORMATION

AUTHOR / PRESENTER INFORMATION

Speaker Check-In and Preview Station

Steinbeck Lobby

Open during Registration Hours

The computers at the Internet Stations are available to preview speakers' presentations. They are identical to the computer in the conference room. Speakers may use their own computer to present and may test their presentations in the conference room before, after or during breaks in the conference schedule. If experiencing any difficulties with a presentation, please visit the SPIE Registration Desk.

Exhibition/Poster Reception

Exhibition Hall

Tuesday 29 September 6:00 to 7:30 pm

Symposium attendees are invited to attend the Exhibition/Poster Reception on Tuesday evening in the Serra Grand Ballroom. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers and interact with the authors, and visit the exhibition booths. Refreshments will be served. Attendees are requested to wear their conference registration badges.

Poster Viewing

Exhibition Hall

Tuesday 29 September 10:00 am to 4:00 pm,
and 6:00 to 7:30 pm

Wednesday 30 September 10:00 am to 3:00 pm

Poster authors may set up their poster papers between 10 am and 4 pm on Tuesday and will leave them up until Wednesday afternoon. Authors will be present during the Poster Reception 6:00 to 7:30 pm Tuesday to answer questions and provide in-depth discussion regarding their papers.

ONSITE SERVICES

Internet Access

Steinbeck Lobby – Internet Stations

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Complimentary wired internet access is available; attendees can hook up their laptops or use provided workstations.

WiFi

WiFi available in the Monterey Conference Center

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Business Center

Monterey Marriott

Attendees may use their hotel room key at the Monterey Marriott to access the onsite Business Center, which offers use of the free online computers. Copy and fax machines are available at the front desk. Copies are free for the first 20 copies, 10 cents per page after. The fax machine is \$1 per page for domestic usage and \$3 per page for international usage.

Urgent Message Line

An urgent message line is available during registration hours: **831.646.5312**

Lost and Found

SPIE Cashier

Registration Hours

Found items will be kept at SPIE Cashier until the close of Registration each day and then turned over to Inact Protective Services, 831.763.2594. At the end of the meeting, all found items will be turned over to Monterey Conference Center, 831.646.3770.

SPECIAL EVENTS

FOOD AND BEVERAGE SERVICES

Breakfast Breads

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Complimentary coffee and breakfast breads will be served Tuesday through Thursday 7:30 to 8:30 am.

Coffee Breaks

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Complimentary coffee will be served Tuesday through Thursday in the following locations.

Tuesday 29 September 10:30 am and 3:20 pm
Serra Grand Ballroom – Exhibition Hall

Wednesday 30 September 10:10 am and 3:00 pm
Serra Grand Ballroom – Exhibition Hall

Thursday 1 October 10:00 am and 3:20 pm
Steinbeck Lobby

SPIE-Hosted Lunches

San Carlos Ballroom – Marriott

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Hosted lunches will be served at the lunch break Tuesday through Thursday in the San Carlos Ballroom at the Monterey Marriott.

Complimentary lunch tickets will be included for full conference registrants attending the Photomask Meeting. NOTE: Scanning attendees, exhibitors and students may purchase tickets in the SPIE registration area in the Portola Lobby.

Desserts

Complimentary tickets for dessert snacks are included in conference attendee and exhibitor registration packets, and served in the exhibition hall during the afternoon coffee break.

GENERAL INFORMATION

OFFSITE SERVICES

FedEx Kinkos is located at 799 Lighthouse Ave., Suite A, Monterey, Calif., 93940, Phone 831.373.2298. It is located 1.3 miles from the Monterey Marriott. Go north on Calle Principal, left onto Del Monte Avenue, right onto Pacific St., right onto ramp to merge onto Lighthouse Avenue.

Child Care Services

The Monterey Marriott suggests the following childcare service companies:

Parents Time Out. Phone: 831.375.9269 VIP

Babysitting Solutions Inc. (in-room hotel babysitting services).
Phone: 800.838.2787

SPIE does not imply endorsement or recommendation for these services. Information provided as “information only” for your further analysis and decision. Other services may be available.

Car Rental

The Hertz logo consists of the word "Hertz" in a bold, black, sans-serif font, set against a bright yellow rectangular background.

Hertz Car Rental has been selected as the official car rental agency for SPIE Scanning Microscopies. To reserve a car, identify yourself as a conference attendee using the Hertz Meeting Code **CV#029B0020**. When booking from international Hertz locations, the CV# must be entered with the letter CV before the number, i.e. CV029B0020.

- In the United States call 1-800-654-2240

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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 or remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, who in their sole opinion are not, or 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 any attendee, exhibitor, representative, or vendor 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.

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SPIE is a professional, not-for-profit society committed to providing valuable conference and exhibition experiences. SPIE is dedicated to equal opportunity and treatment for all its members and meeting attendees. Attendees are expected to be respectful to other attendees, SPIE staff, and contractors. Harassment and other misconduct will not be tolerated; violators will be asked to leave the event.

Identification

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued Photo ID at registration to collect registration materials.

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Payment Method

Registrants for paid elements of the event, who do not provide a method of payment, will not be able to complete their registration. Individuals with incomplete registrations will not be able to attend the conference until payment has been made. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks and wire transfers. Onsite registrations can also pay with Cash.

Authors/Coauthors

By submitting an abstract, you agree to the following conditions:

- An author or coauthor (including keynote, invited, and solicited speakers) will register at the author registration rate, attend the meeting, and make the presentation as scheduled.
- A manuscript (minimum 6 pages) for any accepted oral or poster presentation will be submitted for publication in the SPIE Digital Library and printed conference Proceedings. (Some SPIE events have other requirements that the author is made aware of at the time of submission.)
- Only papers presented at the conference and received according to publication guidelines and timelines will be published in the conference Proceedings and SPIE Digital Library (or via the requirements of that event).

Audio, Video, Digital Recording Policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use the materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at Speaker Check-In. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media.

EXHIBITION HALL: For security and courtesy reasons, recordings of any kind are prohibited unless one has explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their recording media and to leave the exhibition hall.

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Access to Technical and Networking Events

Persons under the age of 18 including babies, carried or in strollers, and toddlers are not allowed in technical or networking events. Anyone 18 or older must register as an attendee. All technical and networking events require a valid conference badge for admission.

Underage Persons on Exhibition Floor Policy

For safety and insurance reasons:

- No persons under the age of 18 will be allowed in the exhibition area during move-in and move-out.
- Children 14 and older, accompanied by an adult, will be allowed in the exhibition area during open exhibition hours only.
- All children younger than 14, including babies in strollers and toddlers, are not allowed in the exhibition area at any time.

Unauthorized Solicitation Policy

Unauthorized solicitation in the Exhibition Hall is prohibited. Any non-exhibiting manufacturer or supplier 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 Policy

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 Policy

At SPIE events where wireless is included with your registration, SPIE provides wireless access for attendees during the conference and exhibition but cannot guarantee full coverage in all locations, all of the time. Please be respectful of your time and usage so that all attendees are able to access the internet.

Excessive usage (e.g., streaming video, gaming, multiple devices) reduces bandwidth and increases cost for all attendees. No routers may be attached to the network. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop as well as potentially introduce viruses to your computer and/or presentation. SPIE is not responsible for computer viruses or other computer damage.

Mobile Phones and Related Devices Policy

Mobile phones, tablets, laptops, pagers, and any similar electronic devices should be silenced during conference sessions. Please exit the conference room before answering or beginning a phone conversation.

Smoking

For the health and consideration of all attendees, smoking, including e-cigarettes, is not permitted at any event elements, such as but not limited to: plenaries, conferences, workshops, courses, poster sessions, hosted meal functions, receptions, and in the exhibit hall. Most facilities also prohibit smoking and e-cigarettes in all or specific areas. Attendees should obey any signs preventing or authorizing smoking in specified locations.

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.

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

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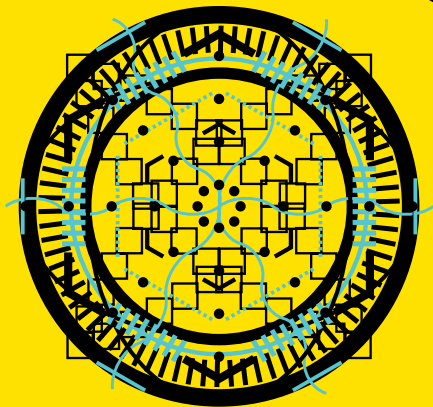
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