2015 International Workshop on EUV Lithography

June 15-19, 2015

Makena Beach & Golf Resort ▪ Maui, Hawaii

Workshop Agenda

EUV
Litho, Inc.

2015 International Workshop on EUV Lithography

Makena Beach & Golf Resort, Maui, Hawaii, USA

June 15-19, 2015

Workshop Agenda Outline

Monday, June 15, 2015

8:30 AM -5:00 PM
EUV Lithography Short Course (Makena Salon)

Tuesday, June 16, 2015

3:00 PM - 5:00 PM
Registration (Kaeo Ballroom Foyer)
Speaker Prep (Wailea Salon)

6:00 PM - 7:30 PM
Reception (Pacific Lawn)

Wednesday, June 17, 2015

7:30 AM – 8:30 AM	Breakfast (Café Kiowai)
8:30 AM – 11:40 AM	Oral Presentations (Wailea Salon)
11:40 AM – 1:00 PM	Lunch (Molokini Room)
1:00 PM – 4:00 PM	Oral Presentations (Wailea Salon)
4:00 PM	Afternoon off for Networking

Thursday, June 18, 2015

7:30 AM – 8:30 AM	Breakfast (Café Kiowai)
8:30 AM – 12:00 PM	Oral Presentations (Wailea Salon)
12:00 PM – 1:00 PM	Lunch (Molokini Room)
1:00 PM – 5:00 PM	Oral Presentations (Wailea Salon)
5:00 PM - 6:00 PM	Poster Session (Wailea Salon Foyer)
6:30 PM – 8:00 PM	Dinner (Pacific Lawn)

Friday, June 19, 2015

8:30 AM – 10:00 AM EUVL Workshop Steering Committee Meeting (Café Kiowai)

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Workshop Agenda

Monday, June 15, 2015

Short Courses

EUV Lithography
by Vivek Bakshi (EUV Litho, Inc.), Patrick Naulleau (LBNL) and Jinho Ahn (Hanyang University)

8:30 AM -5:00 PM (Makena Salon)

Tuesday, June 16, 2015

Registration and Reception

3:00 PM- 5:00 PM	Registration & Speaker Prep
6:00 PM- 7:30 PM	Reception

Wednesday, June 17, 2015

8:30 AM Welcome and Introduction

Introductions (Intro-1)
Vivek Bakshi
EUV Litho, Inc., Austin, TX, USA

Session 1: Keynote – 1

EUVL for HVM: Progress Update (P1)

Mark Phillips
Intel Corporation, Hillsboro, OR 97124, USA

Challenges of EUV Lithography for HVM (P2)

Takayuki Uchiyama
Lithography Process Development Department, Center for Semiconductor Research and Development, Toshiba Corporation, Japan

Break (20 minutes)

Session 2: Optics and Contamination

Progress with Capping Layer and Optics Refurbishment Development at RIT (Invited Talk) (P72)

Yuriy Platonov[a], Michael Kriese[a], Vladimir Martynov[a], Raymond Crucet[a], Yang Li[a],
Steven Grantham[b], Charles Tarrio[b], John Curry[b], Shannon Hill[b], Thomas Lucatorto[b]
[a]*Rigaku Innovative Technologies, 1900 Taylor Rd., Auburn Hills, MI 48326, USA*
[b]*Institute for Standards and Technology, Gaithersburg, MD 20899, USA*

Issues in the Testing of Non-CAR Materials in Hydrogen Atmospheres (Invited Talk) (P73)

C. Tarrio, R. F. Berg, S. B. Hill, and T. B. Lucatorto
Sensor Science Division, National Institute of Standards and Technology, Gaithersburg, MD, 20899, USA

Collector Cleaning and EUV Extendability (Invited Talk) (P74)

David N. Ruzic, Daniel T. Elg, Gianluca A. Panici, Shailendra N. Srivastava
Center for Plasma Material Interactions, Department of Nuclear, Plasma, and Radiological Engineering, University of Illinois at Urbana-Champaign

Scintillators and Imaging in EUV/XR Spectral Region (Invited Talk) (P71)

Ladislav Pina
Czech Technical University in Prague (Czech Republic)

Lunch 11:40 AM – 1:00 PM

Session 3: EUV Resists

Recent Progresses in Negative-tone Imaging using EUV Exposure (Invited Talk) (P62)

Toru Fujimori, Toru Tsuchihashi and Toshiro Itani
EUVL Infrastructure Development Center, Inc. (EIDEC), 16-1 Onogawa, Tsukuba-shi, Ibaraki 305-8569, Japan

Novel EUV Resist Development for sub-14 nm Half pitch (Invited Talk) (P64)

Yoshi Hishiro
JSR Micro INC, 1280 N. Mathilda Ave, Sunnyvale, CA 94089, USA

Dissolution Dynamics of Chemically Amplified Resists for Extreme Ultraviolet Lithography Studied by Quartz Crystal Microbalance (Invited Talk) (P65)

Masaki Mitsuyasu, Hiroki Yamamoto and Takahiro Kozawa
The Institute of Scientific and Industrial Research, Osaka University, Address: 8-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan

Characterization of Inorganic Resists Using Temperature Programmed and Electron Stimulated Desorption (P61)

Gregory S. Herman and Ryan Frederick
Oregon State University, School of Chemical, Biological and Environmental Engineering
102 Gleeson Hall, Corvallis, OR USA

EUV Patterning Improvement Toward High-volume Manufacturing (Invited Talk) (P63)

Yuhei Kuwahara [1], Koichi Matsunaga [1], Shinichiro Kawakami [1], Kathleen Nafus [1], Philippe Foubert [2], Anne-Marie Goethals [2]
[1] Tokyo Electron Kyushu Ltd., 1-1 Fukuhara, Koshi city, Kumamoto, 861-1116, Japan
[2] IMEC, Kapeldreef 75, B-3001, Leuven, Belgium

Break 2:40 PM (20 Minutes)

Session 4: EUVL Regional Reviews

Wang Xiangzhao (SIOM, China)

Bob Rollinger (ETHZ, Europe)

Jinho Ahn (Hanyang University, Korea)

Takayuki UCHIYAMA (TOSHIBA, Japan)

Patrick Naulleau (CXRO, USA)

Taiwan (TBD)

Adjourn: Time off for Networking

End Day 1

Thursday, June 18, 2015

Welcome and Announcements (Intro-2)
Vivek Bakshi
EUV Litho, Inc.

Session 5: Keynote-2

HVM LPP Light Sources for EUVL (Tentative Title) **(P3)**

Speaker TBA, ASML - San Diego, San Diego, USA

Session 6: EUV Sources

Update of One Hundred Watt HVM LPP-EUV Source (Invited Talk) (P33)

Hakaru Mizoguchi, Hiroaki Nakarai, Tamotsu Abe, Takeshi Ohta, Krzysztof M Nowak, Yasufumi Kawasuji, Hiroshi Tanaka, Yukio Watanabe, Tsukasa Hori, Takeshi Kodama, Yutaka Shiraishi, Tatsuya Yanagida, Georg Soumagne, Tsuyoshi Yamada, Taku Yamazaki , Shinji Okazaki and Takashi Saitou
Gigaphoton Inc. Hiratsuka facility: 3-25-1 Shinomiya Hiratsuka Kanagawa,254-8567, JAPAN

States and Prospects of Laser Drivers for 250W and Toward > 500W Extreme ultraviolet (EUV) Generation (Invited Talk) (P35)

Koji Yasui[1] and Jun-ichi Nishimae[2]
[1]*Mitsubishi Electric Corporation, Head quarter, Tokyo, Japan*
[2]*Mitsubishi Electric Corporation, Advanced technology R&D center, Hyogo, Japan*

XUV Research with Compact DPP and LPP Laboratory Sources: Complementary to Beamlines and Large Scale Industrial Tools (Invited Talk) (P31)

Rainer Lebert[1], Christoph Phiesel[1], Thomas Mißalla[1], Christian Piel[1], Klaus Bergmann[2], Alexander von Wezyk[2], Jochen Vieker[2],Serhiy Danylyuk[3], Lukas Bahrenberg[3], Stefan Herbert[3], Larissa Juschkin[4], Aleksey Maryasov[4]
[1] *RI Research Instruments GmbH (RI), 51429 Bergisch-Gladbach, Germany*
[2]*Fraunhofer Institute for Laser Technology (FhG-ILT)*
[3] *Chair for the Technology of Optical Systems*
[4]*Chair for the Experimental Physics of EUV*
[3, 4] *at RWTH Aachen University;*
[2,3,4] *at 52074, Aachen, Germany*

Plasma Design of the EQ-10 EUV Source (Invited Talk) (P34)

Stephen F. Horne, Matthew J. Partlow, Deborah S. Gustafson, Matthew M. Besen, Donald K. Smith, Paul A. Blackborow
Energetiq Technology Inc., 7 Constitution Way, Woburn MA 01801 USA

High Brightness LPP Light Sources for High Volume Inspection (Invited Talk) (P36)

Bob Rollinger
Swiss Federal Institute of Technology, Laboratory for Energy Conversion, ETH Zurich, ML J23, Sonneggstrasse 3, 8092 Zürich, Switzerland

Break (20 Minutes)

Session 7: Panel Discussion (40 Minutes)

Lunch 12:00 PM (60 Minutes)

Session 8: FEL based Sources for EUVL

LCLS-II and Free Electron Laser Drivers for EUV Lithography (Invited Talk) (P44)

Aaron Tremaine
SLAC, 2575 Sand Hill Road, Menlo Park, 94025, USA

An ERL-Based High-Power Free-Electron Laser for EUV Lithography (Invited Talk) (P42)

Norio Nakamura
High Energy Accelerator Research Organization (KEK), Tsukuba, Ibaraki 305-0801, Japan

EUV Radiation from a Microbunched Storage Ring (Invited Talk) (P41)

Daniel Ratner, Alex Chao
SLAC, 2575 Sand Hill Road, Menlo Park, 94025, USA

TESSA – a Novel High Efficiency EUV Source (Invited Talk) (P43)

A. Murokh[1], J. Duris[2], P. Musumeci[2]
[1]*RadiaBeam Technologies, USA*
[2]*UCLA, USA*

Simulation of an Electron Gun for ERL-FEL Based EUV Lithography System (Invited Talk) (P45)

Taisuke Kawasaki[1], Makoto Takemura[1], Haruo Miyadera[1],Tsukasa Miyajima[2], Masahiro Yamamoto[2], Yosuke Honda[2], Takashi Uchiyama[2], Xiuguang Jin[2], Yukihide Kamiya[2], Hiroshi Kawata[2], Yukinori Kobayashi[2], Nobuyuki Nishimori[3], Ryoichi Hajima[3]
[1]TOSHIBA Corporation:8, Shinsugita-Cho, Isogo-Ku, Yokohama 235-8523, Japan
[2]High Energy Accelerator Research Organization (KEK): 1-1 Oho, Tsukuba, Ibaraki 305-0801, Japan
[3]Japan Atomic Energy Agency (JAEA): 4-49 Muramatsu, Tokai-mura, Naka-gun, Ibaraki 319-1184, Japan

Break 2:40 PM (20 Minutes)

Session 9: EUV Masks

Current Status and Outlook for EUV Mask (Invited Talk) (P52)

Takashi Kamo
Lithography Process Development Department,
Center for Semiconductor Research & Development, TOSHIBA Corporation, Kanagawa 212-8583, Japan

Progress Towards Actinic Patterned Mask Inspection (Invited Talk) (P51)

Oleg Khodykin
RAPID, KLA-Tencor Inc., USA

Critical Defect Size on the Extreme Ultraviolet (EUV) Mask and Cleaning Process for its Removal (Invited Talk) (P54)

Min-Su Kim[a], Hye-Rim Ji[b], In-Seon Kim[b], Hye-Keun Oh[b], Jin-Ho Ahn[c] and Jin-Goo Park[a†]
[a]Department of Materials Engineering and Bio-Nano Technology, Hanyang University, Ansan, Korea,
[b] Department of Applied Physics, Hanyang University, Ansan, Korea,
[c]Department of Materials Science and Engineering, Hanyang University, Seoul, Korea

Tabletop-Scale EUV Coherent Phase-And-Amplitude Imaging Using High Harmonics (P55)

Daniel E. Adams, Dennis F. Gardner, Elisabeth R. Shanblatt, Christina L. Porter, Robert M. Karl, Michael D. Tanksalvala, Henry C. Kapteyn, Margaret M. Murnane
JILA, University of Colorado, 440 UCB, Boulder, Colorado 80309-0440, USA

Multilayer Mask Roughness: the Relative Importance of Phase and Amplitude (Invited Talk) (P56)

Patrick P. Naulleau[1], Kenneth A. Goldberg[1], Eric Gullikson[1],Rene Claus[2], Henry Wang[2], Andy Neureuther[2]
[1]*Center for X-Ray Optics, Lawrence Berkeley National Laboratory, Berkeley, CA 94720*
[2]*University of California at Berkeley, Berkeley, CA 94720*

EUVL Workshop Summary (P90)

Vivek Bakshi
EUV Litho, Inc.

5:00- 6:00 PM Poster Session

6:30 -8:00 PM Dinner

Session 10: Poster Session

Additional Poster Papers To be Announced. The deadline for post deadline poster paper submission is May 29, 2015.

XUV, EUV and Soft-X-Ray Solutions with Compact Laboratory-Sources (P32)

Rainer Lebert[1], Christoph Phiesel[1], Thomas Mißalla[1], Christian Piel[1], Klaus Bergmann[2], Alexander von Wezyk[2], Jochen Vieker[2], Serhiy Danylyuk[3], Lukas Bahrenberg[3], Stefan Herbert[3]
[1] RI Research Instruments GmbH (RI), 51429 Bergisch-Gladbach, Germany
[2]Fraunhofer Institute for Laser Technology (FhG-ILT)
[3] Chair for the Technology of Optical Systems at RWTH Aachen University
[2,3] at 52074, Aachen, Germany

Optimal Shift of Pattern Shifting for Mitigation of Mask Defects in EUV Lithography (P53)

Sikun Li, Xiangzhao Wang, Xiaolei Liu, Heng Zhang
Laboratory of Information Optics and Opto-electronic Technology, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Shanghai, China, 201800

Title TBA (P75)

Rupert C. C. Perera
EUV Tech, 2840 Howe Road Suite A, Martinez, CA 94553, USA

Friday, June 19, 2015

8:30 AM - 10:00 AM

EUVL Workshop Steering Committee Meeting (Kaeo Ballroom)

8:30 AM - 10:00 AM	Breakfast (Café Kiowai)

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