2012 International Workshop on EUV Lithography

June 4-8, 2012

Sheraton Maui ▪ Maui, Hawaii

Workshop Agenda

EUV LITHO, INC.

2012 International Workshop on EUV Lithography

Sheraton Maui Resort, Maui, Hawaii, USA

June 4-8, 2012

Workshop Agenda Outline

Monday, June 4, 2012

8:30 AM -5:00 PM

EUV Lithography Short Course (Hana Room)

Tuesday, June 5, 2012

3:00 PM- 5:00 PM

Registration (Maui Ballroom Foyer)
Speaker Prep (Wailuku/Kahului Room)

5:30 PM- 7:00 PM

Reception (Ocean Lawn)

Wednesday, June 6, 2012

7:30 AM – 8:30 AM Breakfast

8:30 AM – 12:00 PM Oral Presentations (Wailuku/Kahului Room)

12:00 PM – 1:00 PM Lunch (Kihei /Wailea Room)

1:00 PM – 3:15 PM Oral Presentations (Wailuku/Kahului Room)

3:15 PM Afternoon off for Networking

Thursday, June 7, 2012

7:30 AM – 8:30 AM Breakfast

8:30 AM – 12:00 PM Oral Presentations (Wailuku/Kahului Room)

12:00 PM – 1:00 PM Lunch (Napili Room)

1:00 PM – 5:20 PM Oral Presentations (Wailuku/Kahului Room)

5:20 PM - 6:20 PM Poster Session

6:30 PM – 8:00 PM Dinner (Ocean Lawn)

Friday, June 8, 2012

8:30 AM – 10:00 AM EUVL Workshop Steering Committee Meeting
(Hana Room)

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Sheraton Maui Resort, Maui, Hawaii, USA
June 4-8, 2012

Workshop Agenda

Monday, June 4, 2012

Short Courses

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

8:30 AM -5:00 PM

Tuesday, June 5, 2012

Registration and Reception

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

Wednesday, June 6, 2012

8:30 AM Welcome and Introduction

Vivek Bakshi
EUV Litho, Inc., Austin, TX, USA

Session 1: Keynote Presentations

EUV Lithography at Insertion and Beyond (P1)
Yan Borodovsky
Portland Technology Development, Intel Corporation

Persistent Efforts to Overcome the Challenge of EUVL (P3)
Soichi Inoue
EUVL Infrastructure Development Center, Inc. (EIDEC)

Break

Session 2: Panel Discussion: EUVL HVM Insertion and Scaling

Moderator: Sushil Padiyar (AMAT) (P4)

Panelists Presentations:

Yan Borodovsky (P5)
Intel Corporation

Takashi Kamo (P6)
Toshiba

Pawitter Mangat (P7)
GlobalFoundries

Discussion Summary (P10)
Sushil Padiyar
AMAT

Business Presentation

MEDB Presentation (P39)
David Raatz
Maui Economic Development Board (MEDB)

AWARD CEREMONY and GROUP PHOTGRAPH

Lunch

Session 3: Beyond EUV (BEUV)

Possibility of EUVL System at the Wavelength of 6.8 nm (P34)
Hiroo Kinoshita
University of Hyogo, Center for EUV Lithography
1-1-2 Kouto Kamigouri Ako-gun, Hyogo Pref. 678-1205, Japan

Fundamental Property of 6.X-nm EUV Emission (P23)
Takeshi Higashiguchi[1, 2], Takamitsu Otsuka[1], Noboru Yugami[1, 2], Thomas Cummins[3], Colm O'Gorman[3], Bowen Li[3], Deirdre Kilbane[3], Padraig Dunne[3], Gerry O'Sullivan[3], Weihua Jiang[4], and Akira Endo[5]
[1]Department of Advanced Interdisciplinary Sciences, and Center for Optical Research & Education (CORE) Utsunomiya University, Yoto 7-1-2, Utsunomiya, Tochigi 321-8585, Japan
[2]Japan Science and Technology Agency, CREST, 4-1-8 Honcho, Kanagawa, Saitama 332-0012, Japan
[3]School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
[4]Department of Electrical Engineering, Nagaoka University of Technology, Kami-tomiokamachi 1603-1, Nagaoka, Niigata 940-2188 Japan
[5] HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 18221 Prague 8, Czech Republic

Investigating the Effects of Laser Power Density, Pulse Duration and Viewing Angle on a 6.7nm BEUV Source (P15)
Colm O'Gorman[1], Thomas Cummins[1], Takamitsu Otsuka[2], Noboru Yugami[2, 3], Weihua Jiang[4], Akira Endo[5], Bowen Li[1], Padraig Dunne[1], Emma Sokell[1], Gerry O'Sullivan[1], and Takeshi Higashiguchi[2, 3]
[1]School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
[2]Department of Advanced Interdisciplinary Sciences, Center for Optical Research & Education (CORE), and Optical Technology Innovation Center (OpTIC), Utsunomiya University, Yoto 7-1-2, Utsunomiya, Tochigi 321-8585 Japan
[3]Japan Science and Technology Agency, CREST, 4-1-8 Honcho, Kanagawa, Saitama 332-0012 Japan
[4]Department of Electrical Engineering, Nagaoka University of Technology, Kami-tomiokamachi 1603-1, Nagaoka, Niigata 940-2188 Japan
[5]Research Institute for Science and Engineering, Waseda University, Okubo 3-4-1, Shinjuku, Tokyo 169-8555 Japan

Break

Session 4: Mask and Mask Metrology

Effect of Mask Roughness on Mask Inspection (P35)
Patrick Naulleau
Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, CA 94720

Development of Actinic Mask Inspection Systems (P33)
Hiroo Kinoshita[a, c], Tetuso Harada[a, c], Yutaka Nagata[b, c], Mitunori Toyoda[d], and Takeo Watanabe[a, c]
[a]University of Hyogo, Center for EUV Lithograph, 1-1-2 Kouto Kamigouri Ako-gun, Hyogo Pref. 678-1205, Japan
[b]Riken, 2-1 Hirosawa, Wako, Saitama Pref. 351-0198, Japan
[c]JST CREST, 5-3 Bancho, Chiyoda, Tokyo 102-0075, Japan
[d]Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai 980-8577,Japan

Optical Design of Absorber Materials for Reduced H-V CD Bias in EUV Lithography (P38)
Seongchul Hong, Sangsul Lee, Jae Uk lee, Inhwan Lee[1], and Jinho Ahn
Department of Materials Science and Engineering, Hanyang University, Seoul 133-791, Korea
[1]Memory Research & Development Division, Hynix Semiconductor Inc.

Adjourn: Time off for Networking

End Day 1

Day 2: Thursday, June 7, 2012

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

Session 5: Contamination

Resist-outgas Testing and EUV Optics Contamination at NIST (P21)
S. B. Hill [1], N. S. Faradzhev [2], L. J. Richter [1], S. Grantham [1], C. Tarrio [1], and T. B. Lucatorto[1]
[1] National Institute of Standards and Technology, Gaithersburg, MD, USA
[2] University of Virginia, Charlottesville, VA, USA

Development of the Novel Evaluation Tool with an In-situ Ellipsometer for the Thickness Measurement of the Contamination Originated by the High Power EUV Irradiation on EUV Resist (P27)
Takeo Watanabe[1], Yukiko Kikuchi[2], Toshiya Takahashi[2], Kazuhiro Katayama[2], Isamu Takagi[2], Norihiko Sugie[2], Hiroyuki Tanaka[2], Eishi Shiobara[2], Soichi Inoue[2]
Testuo Harada[1], and Hiroo Kinoshita[1]
[1]Center for EUVL, Laboratory of Advanced Science and Technology for Industry, University of Hyogo
[2]EUVL Infrastructure Development Center, Inc. (EIDEC)

Nanoparticle/AMC Contamination Control and Metrology for the Extreme Ultraviolet Lithography (EUVL) Systems (P19)
David Y.H. Pui
Mechanical Engineering Department, University of Minnesota, 111 Church Street, SE, Minneapolis, MN 55455, USA

Strategies for Cleaning EUV Optics, Masks and Vacuum Systems with Downstream Plasma Cleaning (P42)
Christopher G. Morgan, David Varley, Ewa Kosmowska and Ronald Vane
XEI Scientific, Inc.
1755 E. Bayshore Blvd., Redwood City, CA 94063

Recent Developments in Construction of Metrology, Calibration, and Resist Testing Tools for the Successful HVM Implementation of EUV Lithography (P43)
Rupert Perera et al
EUV Technology
837 Arnold Drive, Suite 400, Martinez, CA 94553

Break

Session 6: Optics

EUV Multilayer Coatings: Potentials and Limits (Review Paper) (P26)
Sergiy Yulin, Torsten Feigl, Viatcheslav Nesterenko, Mark Schürmann, Marco Perske, Hagen Pauer, Tobias Fiedler, Norbert Kaiser
Fraunhofer-Institut für Angewandte Optik und Feinmechanik, Albert-Einstein-Str. 7, 07745 Jena, Germany

Multilayer Mirrors for EUVL: Status and Progress (P22)
Yuriy Platonov, Jim Rodriguez, Michael Kriese, Vladimir Martynov
Rigaku Innovative Technologies, 1900 Taylor Rd., Auburn Hills, MI 48326, USA

Recovery Strategies for Mirrors with Boron Carbide-based Coatings for 6.x nm Lithography (P24)
Regina Soufli[1], Mónica Fernández-Perea[1], Sherry L. Baker[1], Jeff C. Robinson[1], Eric M. Gullikson[2], Nicholas M. Kelez[3], John D. Bozek[3]
[1]Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, CA 94550
[2]Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Berkeley, CA 94720
[3]SLAC National Accelerator Laboratory, 2575 Sand Hill Road, Menlo Park, CA 94025

Lunch

Session 7: High Power EUV Sources

Component Technologies of HVM Source for Reliable, High Average Power Operation (Review Paper) (P32)
Akira Endo
Research Institute for Science and Engineering, Waseda University, 3-4-1, Okubo, Shinjuku,Tokyo 169-8555, Japan and
HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 18221 Prague 8, Czech Republic

Investigation of Atomic Processes of High-Z ions in Plasmas for EUV Applications (P14)
Akira Sasaki
Quantum Beam Science Directorate, Japan Atomic Energy Agency
8-1 Umemidai, Kizugawa-shi, Kyoto 619-0215, Japan

Session 8: EUV Sources for Metrology

Novel EUV Light Sources for Photolithography (P13)
Masami Ohnishi[1], Waheed Hugrass[2] , Yukio Miyake[1], Tatsuya Shimizu[1], Kazuya Hanatani[1] and Hodaka Osawa[1]
[1]Kansai university, Faculty of Engineering Science, Department of Electrical and Electronic Engineering, 3-3-35 Yamate-cho, Suita-shi, Osaka 564-8680, Japan
[2]University of Tasmania, School of Computing and Information Systems, Private Bag, 1359, Newnham, Tasmania 7250, Australia

Recent Progress on High Brightness Source Collector Module for EUV Mask Metrology (P17)
Kenneth Fahy[1], Paul Sheridan[1],Padraig Dunne[1,2], and Fergal O'Reilly[1,2]
[1] NewLambda Technologies Ltd, Science Center North, Belfield, Dublin 4, Ireland
[2] UCD School of Physics, UCD, Stillorgan Rd, Dublin 4, Ireland

Electrodeless Z-Pinch EUV Source for Metrology Applications for Today and the Future (P16)
Deborah Gustafson, Stephen F. Horne, Matthew M. Besen, Donald K. Smith, Matthew J. Partlow, Paul A. Blackborow
Energetiq Technology, Inc., 7 Constitution Way, Woburn, MA 0180, USA

Break

Session 9: EUV Resist and Patterning

Status and Challenge of Chemically Amplified Resists for Extreme Ultraviolet Lithography (Review Paper) (P29)
Takahiro Kozawa
The Institute of Scientific and Industrial Research, Osaka University
8-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan

Evaluation of Resist Performance with EUV Interference Lithography for 22 to 11 nm HPs (P18)
Yasin Ekinci[a,b], Michaela Vockenhuber[a], Bernd Terhalle[a], Mohamad Hojeij[a], Li Wang[a], Jens Gobrecht[a]
[a] Laboratory for Micro- and Nanotechnology, Paul Scherrer Institute, 5232 Villigen PSI, Switzerland
[b] Laboratory of Metal Physics and Technology, Department of Materials, ETH Zürich, 8093 Zürich, Switzerland

Chemical Reaction Analysis based on the SR Absorption Spectroscopy for the High Sensitive EUV Resist (P28)
Takeo Watanabe[1], Daiju Shiono[2], Yuichi Haruyama[1], Tetsuo Harada[1], and Hiroo Kinoshita[1]
[1] Center for EUVL, Laboratory of Advanced Science and Technology for Industry, University of Hyogo
[2] Tokyo Ohka Kogyo

EUV Resist Development Status toward sub-20nm Half-Pitch (P36)
Tooru Kimura
JSR Corporation, 100, Kawajiri-cho, Yokkaichi, Mie, Japan

EUVL Workshop Summary (P50)
Vivek Bakshi
EUV Litho, Inc.

Break

5:20- 6:20 PM Poster Session

Session 10: Poster Session

An Estimation of the Mask Shadow Effect and its Compensation as Flexible Illumination system in EUVL (P11)
Sangheon Lee, Junhwan Lee, Sanghyun Ban, Hye-Keun Oh[1], Byungho Nam[2], Sangpyo Kim[2], Donggyu Yim[2], and Ohyun Kim
Department of Electrical Engineering, Pohang University of Science and Technology, Pohang, Gyeongbuk 790-784, Korea
[1]Department of Applied Physics, Hanyang University, Ansan, Gyeonggi-do, Korea
[2]Hynix Semiconductor, Cheongju, Chungbuk, Korea

Research of the EUV Radiation and CO_2 Laser Produced Tin Plasma (P12)
Wang Xinbing[1], Zuo DouLuo[1], Lu Peixiang[2], Wu Tao[1]
[1]Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology, Wuhan 430074, China
[2] School of Physics, Huazhong University of Science and Technology, Wuhan 430074, China

Comparison of Temporal Evolution of the EUV emission in Gadolinium and Tin Laser-Produced Plasmas (P20)
Imam Kambali, Tony Donnelly, Enda Scally, Gerry O'Sullivan, Padraig Dunne and Fergal O'Reilly
School of Physics, University College Dublin, Dublin 4, Ireland

Laser Assisted Vacuum Arc (P25)
Isaac Tobin[1], Larissa Juschkin[2], Fergal O'Reilly[2], Paul Sheridan[2], Emma Sokel[2], James G. Lunney[1]
[1] School of Physics, Trinity College Dublin, Dublin 2, Ireland
[2] School of Physics, University College Dublin, Belfield Dublin 4, Ireland

Coherent EUV Source Based on High-order Harmonic Generation for Actinic Inspection Tool (P41)
Jae-uk Lee[1], Sangsul Lee[1], Jonggul Doh[1,2], Seongchul Hong[1], Seungmin Lee[1], Seejun Jeong[1]and Jinho Ahn[1]
[1] Department of Materials Science and Engineering, Hanyang University
[2] Photomask Team, Memory Division, Semiconductor Business, Samsung Electronics Co., LTD

Inverse Compton Source for EUVL Metrology (P44)
P. Frigola[1], S. Boucher[1], A. Murokh[1], L. Holewa[1], I. Pogorelsky[2], V. Yakimenko[2], T.Shaftan[3]
[1]RadiaBeam Technologies, LLC, 1717 Stewart Street, Santa Monica, CA 90404, USA
[2]Accelerator Test Facility, Brookhaven National Laboratory, Upton, New York 11973
[3]NSLS-II, Brookhaven National Laboratory, Upton, New York 11973

High CE Technology for HVM EUV Source (P45)

Hakaru Mizoguchi and Shinji Okazaki[1]
Gigaphoton, 400 Yokokura-shinden Oyama-shi Tochigi, 323-8558, JAPAN
[1]*Gigaphoton, 3-25-1 Shinomiya, Hitatsuka-shi, Kanagawa 254-8555, JAPAN*

Friday, June 8, 2012

8:30 AM - 10:00 AM

EUVL Workshop Steering Committee Meeting (Hana Room)

8:30 AM - 9:00 AM	Breakfast
9:00 AM – 10:00 AM	Steering Committee Meeting


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