2010 International Workshop on Extreme Ultraviolet Sources

November 13-15, 2010
University College Dublin ▪ Dublin, Ireland

Workshop Proceedings

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Litho, Inc.

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Workshop Agenda Outline

Saturday, November 13, 2010

Location: Clinton Auditorium, UCD Campus, Building # 30

5:00 - 7:00 PM	Reception and Speaker Prep

Sunday, November 14, 2010

Location: Clinton Auditorium, UCD Campus, Building # 30

EUVL Applications of EUV Sources

8:00 AM	Pickup at the Hotel
9:00 AM – 12:00 PM	Workshop Presentations
12:00 -1:00 PM	Lunch
1:00 – 4:30 PM	Workshop Presentations
5:30 – 7:00 PM	Poster Session and Reception
7:00 PM	Dinner (Guinness Visitor Center)

Monday, November 15, 2010

Location: O'Reilly Hall, UCD Campus, Building # 40

Non-EUVL Applications of EUV Sources

8:00 AM	Pickup at the Hotel
9:00 AM – 12:00 PM	Workshop Presentations
12:00 -1:00 PM	Lunch
1:00 PM	Depart for tour of Newgrange

WORKSHOP PROCEEDINGS

2010 International Workshop on EUV Sources

November 13-15, 2010, University College Dublin, Dublin, Ireland

Saturday, November 13, 2010

5:00 – 7:00 PM Reception and Registration

Sunday, November 14, 2010

9:00 AM Session 1: Introductions

Introduction - Day 2 (Intro-1)
Vivek Bakshi, EUV Litho, Inc.

Welcome to UCD (Intro-2)
Des Fitzgerald, VP Research, UCD

9:15 AM Session 2: Keynote-1

Next Generation of EUV Lithography: Challenges and Opportunities (P14)
Vadim Banine, ASML

9:45 AM Session 3: Next Generation HVM Sources

Session Chair: Vadim Banine

20 minute presentations
Update: 1st generation Laser-Produced Plasma Source System for HVM EUV Lithography (P4)
Hakaru Mizoguchi, Gigaphoton

New Type of DPP Source for EUVL Based on Liquid Tin Jet Electrodes (P19)
Konstantin Koshelev, ISAN

High Power EUV DPP light Source (P1)
Vladimir Borisov, TRINITI

10:45 AM Break (15 Minutes)

11:00 AM Session 4

Next Generation non 13.5 nm EUV Sources

Session Chairs: Gerry O'Sullivan and Akira Endo

20 minute presentations

Science Foundation Ireland: Research for Ireland's Future (Intro 4) (5 Minute Presentation)
Graeme Horley, SFI

Towards Shorter Wavelength EUV and Soft X-ray Sources (P45)
Gerry O'Sullivan, UCD

Investigation of Atomic Processes in Laser Produced Plasmas for the Short Wavelength Light Sources (P10)
Akira Sasaki, JAEA

Are the Extremely Hot Oxygen and Nitrogen Plasmas the Debris-less Soft X-ray Light Source? (P27)
Hajime Tanuma, Tokyo Metropolitan University

Experimental Study of Laser Produced gadolinium Plasma Emitting at 6.7 nm (P20)
Konstantin Koshelev, ISAN

Rare-earth Plasma Extreme Ultraviolet Sources at 6.5-6.7 nm for Next Generation Semiconductor Lithography (P6)
Takeshi Higashiguchi, Utsunomiya University

12:40 PM LUNCH (50 Minutes)

1:30 PM Session 5: EUV Sources for EUV Metrology - 1

Session Chairs: Rainer Lebert and Sergey Zakharov

15 minute Presentations

The Request for High-brilliant XUV Sources: A First Principle Approach (P2)
Rainer Lebert, Bruker

EQ-10 Electrodeless Z-Pinch EUV Source for Metrology Applications (P22)
Debbie Gustafson, Energetiq

Brilliance Scaling of Discharge Based EUV and Soft X-ray Sources (P5)
Klaus Bergman, Xtreme/ ILT

Robust Liquid Metal Collector Mirror for EUV and Soft X-ray Plasma Sources (P41)
Ken Fahey, UCD

Multiplexed EUV Sources based on a Compact Module with High Irradiance and Low Etendue for Actinic Inspections and Metrology Applications (P34)
Sergey V. Zakharov, NanoUV

Characterization of a High Brightness Sn Droplet EUV Source (P3)
Oran Morris, ETHZ

Optimization Studies of the LPP Short-wave Radiation Source with Xe Gas Jet Target in the Ioffe Institute (P11)
Serguei G. Kalmykov, Ioffe Physical-Technical Institute

Advanced INNOSLAB Solid-state-lasers for XUV/EUV-generation (P37)
Peter Loosen, ILT

3:30 PM Break (15 Minutes)

3:45 PM Session 6: ML Optics

Session Chairs: Yuriy Platonov and Regina Soufli

20 minute presentations

Multilayer Optics for EUV and Beyond (P25)
Hagen Pauer, Fraunhofer-Jena

Status of EUVL Multilayer Optics Deposition at RIT (P31)
Yuriy Platonov, RIT

Development of Reflective Coatings for BEUV Lithography (P17)
Denis Glushkov, ASML

Development of Multilayer Spectral Purity Filters for EUVL tools (P29)
Leonid A. Sjmaenok, PhysTex

X-ray Optics for the LCLS Free-electron Laser (P49)
Regina Soufli, LLNL

5:30 – 7:00 PM Session 7: Poster Session

7:00 PM Depart for Dinner (Guinness Visitor Center)

End of Day 2

Session 7: Poster Session

Clinton Auditorium, 5:30 -7:00 PM, November 14, 2010

Topic: Next Generation HVM Sources

1. **Scattering of CO2 Laser Radiation on Tin Plasma Targets** (P26)
V.V. Medvedev, FOM

2. **Understanding the Behavior of Laser-produced Tin Plasmas by Time-Resolved Spectroscopy and Simulation of their Spectra** (P39)
Imam Kambali, UCD

3. **Laser-produced Plasmas of Gold-tin Alloy for EUV sources** (P40)
Imam Kambali, UCD

4. **Tin Target Modeling for 13.5 nm LPP EUV** (P44)
John White, UCD

5. **Optimization of CO2 Laser-produced Sn Plasmas for Next-generation Semiconductor Lithography Sources** (P51)
Thomas Cummins, UCD

6. **Emission Spectroscopy from Laser-Produced Plasmas of Relevance to Source Development** (P53)
Colm O' Gorman, UCD

7. **Rare-earth Plasmas as Next Generation Extreme Ultraviolet Lithography Sources at 6.5-6.7 nm** (P8)
Takamitsu Otsuka, Utsunomiya University

8. **Modeling of Laser Produced Gadolinium Plasma Source at 6.7 nm** (P18)
V. Novikov, KIAM

Topic: ML Optics

9. **5 sr Collector Mirror Coatings for High Power Laser Produced Plasma EUV Sources** (P23)
Marco Perske, Fraunhofer-Jena

Topic: EUV Sources for Metrology

10. **Computational Optimization of the Gas-jet Target in the LPP Short-wave Radiation Source** (P12)
Serguei G. Kalmykov, Ioffe Physical-Technical Institute

11. **A Study of the Laser Produced Plasma in Stationary Gases at Low Pressures** (P13)
Serguei G. Kalmykov, Ioffe Physical-Technical Institute

12. **Influence of High Energy Electrons on EUV and Soft X-ray Emission Spectra of Nonequilibrium Plasma** (P32)
Vasily S. Zakharov, EPPRA

13. **High Intensity EUV and Soft X-ray Plasma Sources Modeling** (P33)
Sergey V. Zakharov, NanoUV

14. **Time and Space Resolved Optical Plasma Diagnostics of Table-Top Scale Laser Produced Tin Plasmas** (P35)
Colm Fallon, DCU

15. **Time Resolved EUV Emission Spectra of Table-Top Scale Laser Produced Tin Plasmas** (P36)
Patrick Hayden, DCU

16. **High Order Harmonic Radiation from Laser Plasmas** (P38)
Robert Stefanuik, UCD

17. **Z-pinch Discharge in Laser Produced Plasma** (P43)
Isaac Tobin, TCD

18. **Design and Analysis of Liquid Metal EUV Collector Mirrors using the Zemax Ray Tracing Code** (P52)
Ken Fahey, UCD

19. **Laser Produced Lead / Tin Alloy Plasma for EUV lithography sources** (P56)
Enda Scally, UCD

Topic: EUVL Metrology

20. **EUV Laser Application for Optical Lithography** (P16)
Davide Bleiner, University of Berne

21. **EUV Dark-Field Microscopy for Actinic Defect Inspection** (P48)
Larissa Juschkin, Aachen University

22. **Interference Lithography at 11 nm with a Laboratory Gas Discharge Source** (P46)
Larissa Juschkin, Aachen University

Topic: Non-EUVL Applications of EUV Sources

23. **GIXUVR- Grazing Incidence Extreme Ultraviolet Reflectometry: An All-Optical Technique for Metrology of Ultra-Thin Layers** (P47)
Larissa Juschkin, Aachen University

24. **Metal Impurities in LiF: Opportunity for X-ray Imaging Detectors Development** (P24)
F. Somma, University of Roma Tre

25. **Spectral and Temporal Behaviors of Alkali Metal Vapor Extreme Ultraviolet Sources for Surface Morphology Applications** (P9)
Takeshi Higashiguchi, Utsunomiya University

Monday, November 15, 2010

9:00 AM Session 8: Introduction

Introduction-Day 3 (Intro-3)
Vivek Bakshi, EUV Litho, Inc.

9:05 AM Session 9 : Keynote-2

Liquid-jet Water-window Sources for Nano-scale Imaging (P50)
Hans M Hertz, KTH

9:35 AM Session 10:

Non-EUVL Applications of EUV Sources

Session Chair: Padraig Dunne

15 Minute Presentations

Two Colour and Two Photon Ionization Processes in Intense Extreme UV and Optical Laser Fields (P54)
John Costello, DCU

Interference Lithography of Graphene Oxide with a Table-top X-ray Laser Source (P42)
Luca Ottaviano, Università dell'Aquila

10:05 AM Session 11:

EUV Source for EUVL Metrology - 2

Session Chair: Debbie Gustafson

15 Minute Presentations

Future of EUV Sources: a FIRE perspective (P55)
Carlo Fanara, EPPRA

Principles and Utility of the EUV Laser (P15)
Davide Bleiner, University of Berne

Design of a Clean, High Brightness Light Source for EUV Lithography Research in Shorter Wavelength Region (P30)
Kazuyuki Sakaue, Waseda University

10:50 AM Break (15 Minutes)

11:05 AM Session 12

EUV Sources for Non-EUVL Applications

Chair: Hans Hertz
15 Minute Presentations

EUV / Soft X-ray Development at Energetiq Technology (P21)
Debbie Gustafson, Energetiq

Extreme Ultraviolet Source at 40 nm with Alkali Metal Vapor for Surface Morphology Applications (P7)
Takeshi Higashiguchi, Utsunomiya University

11:35 AM Workshop Summary and Announcements

Workshop Summary and Announcements (Summary)
Vivek Bakshi, EUV Litho, Inc.

12:00 PM Lunch

1:00 PM Workshop Adjourned
(Leave for Tour of Newgrange)

EUV

LITHO, INC.