2012 International Workshop on EUV and Soft X-Ray Sources

October 8-11, 2012
Dublin • Ireland

Workshop Proceedings
Workshop Proceedings
Agenda Outline

Monday, October 8, 2012
Location: Newman House, Stephen’s Green, Dublin

6:00 - 7:00 PM  Reception and Speaker Prep

Tuesday, October 9, 2012
Location: Clinton Auditorium, UCD Campus, Dublin

7:45 AM  Pickup at the Hotel (Stephen’s Green and Burlington Hotel)

8:30 AM – 11:30 AM  Workshop Presentations

11:40 AM -12:40 PM  Lunch

12:40 PM – 5:30 PM  Workshop Presentations

5:30 PM – 6:30 PM  Poster Session and Reception

6:30 PM  Depart for Off-Site Dinner (Pickup at Clinton Auditorium)
Wednesday, October 10, 2012

Location: Clinton Auditorium
UCD Campus, Dublin

7:45 AM        Pickup at the Hotel (Stephen’s Green and Burlington)
8:30 AM – 1:00 PM Workshop Presentations
1:00 PM – 2:00 PM Lunch
2:00 PM        Depart for tour of Trim Castle (Pickup at Clinton Auditorium)

Thursday, October 11, 2012

Location: Newman House, Stephen’s Green, Dublin

Technical Working Group (TWG) Meeting

8:30 AM        Continental Breakfast
9:00 AM – 10:00 AM TWG Meeting
Monday, October 8, 2012 (Newman House)

6:00 PM – 7:00 PM Reception and Registration

Tuesday, October 9, 2012 (Clinton Auditorium)

8:30 AM  Session 1 : Welcome and Announcements

**Introduction and Announcements** (Intro-1)
Vivek Bakshi, EUV Litho, Inc., USA
Des Fitzgerald, VP, UCD

8:40 AM  Session 2: Keynote-1

Session Chair: Vadim Banine (ASML)

**High Repetition Rate Table-top Soft X-Ray Lasers** (S1)

1 National Science Foundation ERC for Extreme Ultraviolet Science and Technology
2 Electrical and Computer Engineering Department, Colorado State University, Fort Collins, CO 80523
3 Physics Department, Colorado State University, Fort Collins, CO 80523

**Extendibility of LPP EUV Source Technology in Higher Power (kW) and Shorter Wavelength (6.x nm) Operation** (S2)
Akira Endo
Waseda University, Tokyo, Japan
HiLASE Project, Prague, Czech Republic
Awards and Announcements – Padraig Dunne (UCD)

Break 10:00 AM

10:20 AM  Session 3: HVM EUV Sources

Session Chair: Katsuhiko Murakami (NIKON)

**EUV Lithography: Today and Tomorrow? (S10)** (Invited Paper)
Vadim Banine
ASML, The Netherlands

**EUVL - A Reality in the Making**
**The Reality of Laser Assisted Discharge Plasma EUV Light Sources (S49)**
(Invited Paper)
Jeroen Jonkers
XTREME technologies, GmbH, Steinbachstrasse 15, 52074 Aachen, Germany

**New type of DPP source with liquid tin jets electrode - recent progress (S61)**
* RnD-ISAN / EUVLabs, ** TRINITI

**High Brightness, High-average Power Picosecond Thin Disc Laser Program to Specific Requirements from Short Wavelength Light Sources (S28)**
Taisuke Miura, Michal Chyla, Martin Smrž, Patricie Severová, Ondřej Novák, Akira Endo, and Tomáš Mocek
HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 182 21 Prague 8, Czech Republic

Lunch 11:40 AM

12:40 PM  Session 4: EUV Sources for Mask Metrology

Session Co-Chairs: Klaus Bergman (ILT-Fraunhofer) and Larissa Juschkin (RWTH – Aachen)

**EUV Source For Metrology of EUV Masks (Tentative title) (S51)** (Invited Paper)
Heiko Feldmann, Ulrich Müller
Carl Zeiss, 73447 Oberkochen, Germany
Discharge based EUV Source for Metrology (S58) (Invited Paper)
Klaus Bergmann
Fraunhofer Institute for Laser Technology, Steinbachstr. Aachen, Germany

Electrodeless Z-Pinch™ EUV Source for Next Generation EUV Metrology (S36) (Invited Paper)
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, USA 01801

Recent Progress on High Brightness Source Collector Module for EUV Mask Metrology (S31)
Paul Sheridan¹, Kenneth Fahy¹, Padraig Dunne², and Fergal O’Reilly²
¹NewLambda Technologies Ltd, Science Center North, Belfield, Dublin 4, Ireland
²UCD School of Physics, UCD, Stillorgan Rd, Dublin 4, Ireland

Source Brightness Requirements for EUV Microscopes (S39)
(Invited Paper)
Larissa Juschkin¹, Fergal O’Reilly²
¹RWTH Aachen University, Experimental Physics of EUV, Steinbachstr. 15, 52074 Aachen, Germany
and JARA - Fundamentals of Future Information Technology (FIT), 52425 Jülich, Germany
²School of Physics, University College Dublin, Belfield, Dublin 4, Ireland

Break 2:00 PM (20 Minutes)

2:20 PM Session 5: Modeling

Session Co-Chairs: Gerry O’Sullivan (UCD) and Sergey Sergey V. Zakharov (EPPRA)

Modeling and Optimization of Pre-conditioned LPP targets (S52) (Invited Paper)
K. N. Koshelev¹,², V. V. Ivanov¹,², V. G. Novikov¹,³, V. M. Krivtson¹,², A. S. Grushin¹,³, V. Medvedev⁴
¹RnD-ISAN, Troitsk, 142090 Russia
²Institute of Spectroscopy RAS, Troitsk, 142090 Russia
³Keldysh Institute of Applied Mathematics RAS, Moscow, 125047 Russia
⁴Dutch Institute for Fundamental Energy Research, Nieuwegein, The Netherlands
Unresolved Transition Arrays and their role in EUV and Soft X-ray Source Development (S56)
Gerry O’Sullivan¹, John Costello², Thomas Cummins¹, Rebekah D’Arcy¹, Padraig Dunne¹, Akira Endo³, Paddy Hayden², Takeshi Higashiguchi⁴, Imam Kambali¹, Deirdre Kilbane¹, Bowen Li¹, Colm O’Gorman¹, Takamitsu Otsuka⁴, Emma Sokell¹ and Noboru Yugami⁴
¹School of Physics, University College Dublin, Belfield, Dublin 4, Ireland.
²School of Physics, Dublin City University, Glasnevin, Dublin 9
³HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 18221 Prague 8, Czech Republic
⁴Department of Advanced Interdisciplinary Sciences, Utsunomiya University, Yoto 7-1-2, Utsunomiya, Tochigi 321-8585 Japan.

Properties of High-intensity EUV & Soft-X Radiation Plasma Sources (S25)
(Invited Paper)
Vasily S. Zakharov¹,², Sergey V. Zakharov¹,²,³, Peter Choi¹
¹EPPRA sas, Villebon sur Yvette, France in collaboration with KIAM RAS, Moscow, Russia
²NRC Kurchatov Institute, Moscow, Russia
³JIHT RAS and SRC RF TRINITI, Moscow, Russia

4:00 PM Session 6: EUV/ BEUV/ XUV Optics
Session Co-Chairs: Eric Louis (DIFFER) and Yuriy Platonov (RIT)

Multilayers for 6.8 nm Wavelength (S50) (Invited Paper)
I.A. Makhotkin¹, E. Louis¹, E. Zoethout¹, R.W.E. van de Kruijs¹, Andrei M. Yakunin², Stephan Müllender³ and F. Bijkerk¹,⁴
¹FOM Institute DIFFER - Dutch Institute for Fundamental Energy Research, Nieuwegein, the Netherlands
²ASML, Veldhoven, the Netherlands
³Carl Zeiss SMT GmbH, Oberkochen, Germany
⁴MESA+ Institute for Nanotechnology, University of Twente, Enschede, the Netherlands

New High Reflective Multilayer Designs for the EUV and Soft X-ray Range (S57) (Invited paper)
Marco Perske, Hagen Pauer, Tobias Fiedler, Sergiy Yulin, Viatcheslav Nesterenko, Mark Schürmann, Torsten Feigl, Norbert Kaiser
Fraunhofer-Institut für Angewandte Optik und Feinmechanik, Albert-Einstein-Str. 7, 07745 Jena, Germany
Optics for EUV/XUV/XR Sources and Laboratory Submicron Microscopy (S55) (Invited Paper)
Ladislav Pina¹, Veronika Pickova¹, Radka Havlikova¹, Hana Zakova², Alexandr Jancarek¹, Adolf Inneman³, Martin Horvath³, Jiri Marsik³, Peter Oberta³, Henryk Fiedorowicz⁴, Andrzej Bartnik⁴
¹Czech Technical University in Prague, Faculty of Nuclear Sciences and Phys. Engineering, 115 19 Prague 1, Czech Republic
²Czech Technical University in Prague, Faculty of Biomedical Engineering, 272 01 Kladno, Czech Republic
³Rigaku Innovative Technologies Europe, 142 21 Prague 4, Czech Republic
⁴Military University of Technology, Institute of Optoelectronics, 00-908 Warszawa 49, Poland

Corrosion-resistant, Triple-wavelength Mg/SiC Multilayer Coatings for the 25-80 nm Wavelength Region (S45) (Invited Paper)
Regina Soufli¹, Mónica Fernández-Perea¹, Jeff C. Robinson¹, Sherry L. Baker¹, Jennifer Alameda¹, Christopher C. Walton¹, Luis Rodríguez-De Marcos², Jose A. Méndez², Juan I. Larruquert², Eric M. Gullikson³
¹Lawrence Livermore National Laboratory, Livermore, California, US
²Instituto de Óptica, Consejo Superior de Investigaciones Científicas, Madrid, Spain
³Lawrence Berkeley National Laboratory, Berkeley, California, US

Nanoscale Multilayer Membranes as Optical Elements for EUVL (S59)
Nikolay Chkhalo¹, Mikhail Drozdov¹, Evgeny Kluenkov¹, Aleksei Lopatin¹, Valerii Luchin¹, Nikolay Salashchenko¹, Nikolay Tsybin¹, Leonid Sjmaenok², Vadim Banine³, Luigi Scaccabarozzi³, Andrei Yakunin³
¹Institute for Physics of Microstructures RAS, Ulyanova 46, 603155 Nizhniy, Novgorod, Russia
²PhysTeX, Jos Francotteweg 6b, 6291 GP Vaals, Netherlands
³ASML Netherlands, De Run 6501, 5504 DR Veldhoven, Netherlands

5:30 PM – 6:30 PM  Session 7: Poster Session

7:00 PM  Depart for Off-site Dinner
(Royal Dublin Society)

End of Day 2
5:30 PM  Session 7: Poster Session

**Topic: HVM Sources**

**Next Generation of EUV Lithography: Challenges and Opportunities** *(S47)*
Andrei M. Yakunin, Vadim Banine
ASML, Veldhoven, The Netherlands

**Direct Diagnostics Concept for High Power CO₂ Laser at the LPP Focus Spot** *(S20)*
Kazuyuki Sakaue, Yasufumi Yoshida, Ryo Sato, Masakazu Washio, Akira Endo
Research Institute for Science and Engineering, Waseda university, 3-4-1 Okubo, Shinjuku, Tokyo 169-855 Japan

**Research of the CO₂ Laser MOPA System** *(S44)*
Wang Xinbing¹*, Zuo DuLuo¹, Lu Peixiang²
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

**2D PIC Modeling of the EUV Induced Hydrogen Plasma and Comparison to the Observed Carbon Etching Rate** *(S27)*
D.I. Astakhov¹,³*, W.J. Goedheer¹, D.V. Lopaev², V.V. Ivanov³, V.M. Krivtsun³, O. Yakushev³, K.N. Koshelev³, and F. Bijkerk¹,⁴
¹ FOM Institute DIFFER - Dutch Institute for Fundamental Energy Research, P.O. Box 1207, 3430 BE Nieuwegein, The Netherlands
² Institute of Nuclear Physics, Moscow State University, Russia
³ Institute for Spectroscopy, Russian Academy of Sciences, Troitsk, Russia
⁴ MESA+ Institute for Nanotechnology, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands

**Topic: EUV Sources for Mask Metrology**

**Feasibility Study of Microplasma High-brightness EUV Source at 13.5 nm** *(S13)*
Takeshi Higashiguchi¹, Yoichi Hirose¹, Yuhei Suzuki¹, Takamitsu Otsuka¹, Jun-ichiro Sugisaka¹, Akira Endo², Padraig Dunne³, and Gerry O'Sullivan³
¹ 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
² HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 18221 Prague 8, Czech Republic
³ School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
Diagnostics and Modeling of Gas Puff Target Laser Plasma Radiation Source (S18)
Sarka Vondrova¹, Dalibor Panek¹, Petr Bruza¹, Miroslava Vrbova¹, Pavel Vrba², Przemyslaw Wachulak³, Frantisek Krejci¹, ⁴, Jan Jakůbek⁴
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²Institute of Plasma Physics, Academy of Sciences, 182 00 Prague 8, Czech Republic
³Military University of Technology, Institute of Optoelectronics, 00-908 Warszawa 49, Poland
⁴Czech Technical University in Prague, Institute of Experimental and Applied Physics, 128 00 Prague 2, Czech Republic

In-situ Diagnostics for Plasma based Extreme Ultraviolet Sources (S22)
TNO Delft, Stieltjesweg 1, 2628 CK, Delft, the Netherlands

Laser-initiated Discharge-produced Plasma Ablated from Liquid Metal Electrodes (S26)
Vasily S. Zakharov¹⁺, Larissa Juschkin², Sergey V. Zakharov¹⁺, Gerry O’Sullivan³, Emma Sokel³, Isaac Tobin⁴
¹EPPRA sas, Villebon sur Yvette, France
²RWTH Experimental Physics, Aachen, Germany
³University College Dublin, Ireland
⁴Trinity College Dublin, Ireland
⁺ also with NRC Kurchatov Institute, Moscow, Russia
* also with JIHT RAS and SRC RF TRINITI, Moscow, Russia

EUV Emission from Laser-triggered Z-pinched Discharge (S30)
Isaac Tobin¹, Larissa Juschkin²,³, Fergal O’Reilly², Paul Sheridan⁴, Emma Sokel², James G. Lunney¹
¹School of Physics, Trinity College Dublin, Dublin 2, Ireland.
²School of Physics, University College Dublin, Belfield, Dublin 4, Ireland.
³Department of Physics, RWTH Aachen University, Steinbachstr. 15 D-52074 Aachen, Germany.
⁴Newlambda Technologies, UCD Science Centre North, Belfield, Dublin 4, Ireland.

ST-100: Clean Bright Focused Photons (S63)
Paul Sheridan¹, Kenneth Fahy¹, Padraig Dunne², and Fergal O’Reilly²
¹NewLambda Technologies Ltd, Science Center North, Belfield, Dublin 4, Ireland
²UCD School of Physics, UCD, Stillorgan Rd, Dublin 4, Ireland
**Topic: Applications of EUV Sources**

**R&D Actinic Blank Inspection Microscope (S40)**
Larissa Juschkin¹, Stefan Herbert², Aleksey Maryasov², Serhiy Danylyuk², Rainer Lebert³

¹RWTH Aachen University, Experimental Physics of EUV, Steinbachstr. 15, 52074 Aachen, Germany
²RWTH Aachen University, Chair for Technology of Optical Systems, 52074 Aachen, Germany
³Bruker Advanced Supercon GmbH, Waltherstrasse 49-51, 51069 Köln, Germany

**Exploring the Resolution Limit of the Talbot lithography with EUV Light (S41)**
Hyun-su Kim¹, Serhiy Danylyuk², Sascha Brose², Klaus Bergmann³, Detlev Grützmacher³, Larissa Juschkin¹

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²RWTH Aachen University, Chair for Technology of Optical Systems, 52074 Aachen, Germany
³Fraunhofer Institute for Laser Technology, Steinbachstr. 15, Aachen, Germany
⁴Peter Grünberg Institute 9 (PGI-9): Semiconductor Nanoelectronics, Research Center Jülich
and JARA - Fundamentals of Future Information Technology (FIT), 52425 Jülich, Germany

**EUV Interference Lithography with Partially Coherent Laboratory Sources (S64)**
Larissa Juschkin¹, SerhiyDanylyuk², Sascha Brose², Hyun-suKim¹, Jürgen Moers³, Klaus Bergmann⁴, Peter Loosen²,⁴, Detlev Grützmacher³

¹Experimental Physics of EUV, RWTH Aachen University and JARA-Fundamentals of Future Information Technology, Aachen, 52074, Germany,
²Chair for the Technology of Optical Systems, RWTH Aachen University and JARA-Fundamentals of Future Information Technology, Aachen, 52074, Germany,
³Peter Grünberg Institut, Forschungszentrum Jülich and JARA-Fundamentals of Future Information Technology, Jülich, 52425, Germany
⁴Fraunhofer Institute for Laser Technology, Steinbachstr. 15, Aachen, Germany
**Topic: Modeling**

**Modeling of Absorption and Scattering of IR laser Radiation by LPP Targets (S53)**
A. S. Grushin\textsuperscript{1,2}, I. P. Tsygvintsev\textsuperscript{1,2}, V. G. Novikov\textsuperscript{1,2}, V. V. Ivanov\textsuperscript{1,3}
\textsuperscript{1}RnD-ISAN, Troitsk, 142090 Russia
\textsuperscript{2}Keldysh Institute of Applied Mathematics RAS, Moscow, 125047 Russia
\textsuperscript{3}Institute for Spectroscopy RAS, Troitsk, 142090 Russia

**Modeling of Plasma Dynamics and EUV Generation for Distributed Sn Targets Irradiated with Short Laser Pulses (S54)**
V. Ivanov\textsuperscript{1}, A. Grushin\textsuperscript{2}, V. Novikov\textsuperscript{2}, V. Medvedev\textsuperscript{3}, V. Krivtsun\textsuperscript{1}, A. Yakunin\textsuperscript{4}, and K. Koshelev\textsuperscript{1}
\textsuperscript{1}Institute for Spectroscopy RAS, Troitsk, Russia
\textsuperscript{2}Keldysh Institute of Applied Mathematics, Moscow, Russia
\textsuperscript{3}Dutch Institute for Fundamental Energy Research, Nieuwegein, The Netherlands
\textsuperscript{4}ASML, The Netherlands

**Topic: BEUV**

**Alternative Future 6.x nm EUV Sources from Strong In-band Line Emission (S29)**
Thomas Cummins\textsuperscript{1}, Takamitsu Otsuka\textsuperscript{2}, Tony Donnelly\textsuperscript{1}, Weihua Jiang\textsuperscript{3}, Akira Endo\textsuperscript{4}, Padraig Dunne\textsuperscript{1}, Gerry O'Sullivan\textsuperscript{1} and Takeshi Higashiguchi\textsuperscript{2}
\textsuperscript{1}School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
\textsuperscript{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
\textsuperscript{3}Department of Electrical Engineering, Nagaoka University of Technology, Kami-tomiokamachi 1603-1, Nagaoka, Niigata 940-2188 Japan
\textsuperscript{4}HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 182 21 Prague 8, Czech Republic

**A Tunable Beyond Extreme Ultraviolet Source at 6.x nm based on a Laser-produced Plasma from a High-Z Target Mix (S32)**
Colm O'Gorman\textsuperscript{1}, Takamitsu Otsuka\textsuperscript{2}, Weihua Jiang\textsuperscript{3}, Akira Endo\textsuperscript{4}, Bowen Li\textsuperscript{1}, Thomas Cummins\textsuperscript{1}, Padraig Dunne\textsuperscript{1}, Emma Sokell\textsuperscript{1}, Gerry O'Sullivan\textsuperscript{1}, and Takeshi Higashiguchi\textsuperscript{2}
\textsuperscript{1}School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
\textsuperscript{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
\textsuperscript{3}Department of Electrical Engineering, Nagaoka University of Technology, Kami-tomiokamachi 1603-1, Nagaoka, Niigata 940-2188 Japan
\textsuperscript{4}HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 182 21 Prague 8, Czech Republic
Identification of Atomic Resonances for Enhancement of High Harmonic Generation in Laser-produced Plasmas (S35)
R. Stefanuik\textsuperscript{a}, N. Krstulovic\textsuperscript{a}, M. Mahmood\textsuperscript{b}, P. Dunne\textsuperscript{a}, G. O’Sullivan\textsuperscript{a}
\textit{a}: School of Physics, University College Dublin, Ireland
\textit{b}: Institute of Lasers for Postgraduate Studies, University of Baghdad, Iraq

\textbf{EUV Spectra of Highly Charged Heavy Ions in the NIST EBIT (S60)}
D. Kilbane\textsuperscript{a}, J. D. Gillaspy\textsuperscript{b}, Yu. Ralchenko\textsuperscript{b}, J. Reader\textsuperscript{b}, G. O’Sullivan\textsuperscript{a}
\textit{a}: School of Physics, University College Dublin, Belfield, Dublin 4, Ireland
\textit{b}: National Institute of Standards and Technology, Gaithersburg, MD 20899, USA

\textbf{Topic: XUV}

\textbf{Possibility of High-Z Plasma Water Window Sources (S14)}
Takeshi Higashiguchi\textsuperscript{1}, Takamitsu Otsuka\textsuperscript{1}, Weihua Jiang\textsuperscript{2}, Akira Endo\textsuperscript{3}, Bowen Li\textsuperscript{4}, Deirdre Kilbane\textsuperscript{4}, Padraig Dunne\textsuperscript{4}, and Gerry O’Sullivan\textsuperscript{4}
\textsuperscript{1}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
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\textsuperscript{4}School of Physics, University College Dublin, Belfield, Dublin 4, Ireland

\textbf{A Capillary Discharge-preformed Argon Plasma Waveguide for a Coherent Soft X-ray Source (S15)}
Shohei Sakai\textsuperscript{1}, Takeshi Higashiguchi\textsuperscript{1}, Nadezhda Bobrova\textsuperscript{2}, Pavel Sasorov\textsuperscript{2}, and Noboru Yugami\textsuperscript{1}
\textsuperscript{1}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
\textsuperscript{2}Institute for Theoretical and Experimental Physics, B. Cheremushkinskaya str. 25, 117218 Moscow, Russia

\textbf{Measurement of Spectra in Water-window Wavelength Region (S23)}
J. Novak\textsuperscript{1}, M. Nevrkla\textsuperscript{1}, A. Jancarek\textsuperscript{1}, M. Vrbova\textsuperscript{2}, P. Vrba\textsuperscript{3}
\textsuperscript{1}Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, 115 19 Prague 1, Czech Republic
\textsuperscript{2}Czech Technical University, Faculty of Biomedical Engineering, 272 01 Kladno, Czech Republic
\textsuperscript{3}Institute of Plasma Physics, Academy of Sciences, 182 00 Prague 8, Czech Republic
Characterization of Capillary Discharge Water-Window Radiation Source (S24)
Michal Nevrkla¹, Jan Novak¹, Alexandr Jancarek¹, Pavel Vrba², Miroslava Vrbova³
¹Czech Technical University in Prague, Faculty of Nuclear Sciences and Phys. Engineering, 115 19 Prague 1, Czech Republic
²Institute of Plasma Physics, Academy of Sciences, 182 00 Prague 8, Czech Republic
³Czech Technical University in Prague, Faculty of Biomedical Engineering, 272 01 Kladno, Czech Republic

Emission Properties of Non-equilibrium Zirconium Plasma in Soft X-ray Region (S33)
Vasily S. Zakharov*, Sergey V. Zakharov *+
EPPRA sas, Villebon sur Yvette, France
in collaboration with KIAM RAS, Moscow, Russia
* also with NRC Kurchatov Institute, Moscow, Russia
+ also with JIHT RAS and SRC RF TRINITI, Moscow, Russia

A Commercial Laboratory Soft-X-ray Source for Water Window Microscopy (S37)
Stephen F. Horne, Matthew M. Besen, Donald. K Smith
Energetiq Technology, Inc., 7 Constitution Way, Woburn, MA, USA 01801

Spectral Characterization of XUV Sources based on Plasmas Induced by Laser and Capillary Discharge (S38)
P. Kolar¹, D. Panek¹, M. Vrbova¹, M. Nevrkla², P. Vrba³, and A. Jancarek ²
¹Czech Technical University in Prague, Faculty of Biomedical Engineering, Nam. Sitna 3105, 272 01 Kladno, Czech Republic
²Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering, Trojanova 13, 120 00 Praha 2, Czech Republic
³Institute of Plasma Physics, The Academy of Sciences of the Czech Republic, Za Slovankou 1782/3, 182 00 Prague, Czech Republic

XUV Spectroscopy of the Interaction of Laser-produced Plasma with Solid Surfaces (S42)
A S Kuznetsov¹, R Stuik², F Bijkerk¹,³, Eric Louis and A P Shevelko⁴
¹FOM Institute DIFFER – Dutch Institute for Fundamental Energy Research, Postbus 1207, 3430 BE Nieuwegein, The Netherlands
²Leiden Observatory, Universiteit Leiden, Postbus 9513,2300 RA Leiden, The Netherlands
³MESA+ Institute for Nanotechnology, University of Twente, Postbus 217, 7500 AE Enschede, The Netherlands
⁴P.N. Lebedev Physical Institute of the Russian Academy of Sciences, 117924 Moscow, Russia
Wednesday, October 10, 2012

8:30 AM Announcements

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

**Poster Session Awards and Announcements**
Padraig Dunne (UCD)

8:40 AM  Session 9: Keynote-2

Session Chair: Padraig Dunne (UCD)

**Microfocus Sources for EUV and X-ray Applications** (S3)
Alan Michette
Department of Physics, King's College London, Strand, London WC2R 2LS, UK

9:35 AM  Session 10: Business Presentations

Session Chair: Padraig Dunne (UCD)

**Erasmus Mundus Joint Doctorate Programme EXTATIC (EUV and X-Ray Training in Advanced Technologies for Interdisciplinary Cooperation) - Program Review** (S48)
Paul van Kampen
School of Physical Sciences, Dublin City University, Dublin, Ireland

10:05 AM Break (20 Minutes)
10:20 AM  Session 11: BEUV

Session Co-Chairs: Udo Dinger (Carl Zeiss) and Takeshi Higashiguchi (Utsunomiya University)

**Plasma-based UTA Emission in BEUV & Water Window Spectral Regions (S11)** (Invited Paper)
Takeshi Higashiguchi¹, Takamitsu Otsuka¹, Weihua Jiang², Akira Endo³, Thomas Cummins⁴, Colm O’Gorman⁴, Bowen Li⁴, Deirdre Kilbane⁴, Padraig Dunne⁴, and Gerry O'Sullivan⁴

¹Department 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
²Department of Electrical Engineering, Nagaoka University of Technology, Kami-томиокамachi 1603-1, Nagaoka, Niigata 940-2188 Japan
³HiLASE Project, Institute of Physics AS, CR, Na Slovance 2, 18221 Prague 8, Czech Republic
⁴School of Physics, University College Dublin, Belfield, Dublin 4, Ireland

**Dual Laser Plasma Photoabsorption Studies Of Gadolinium In The Extreme Ultraviolet Region (S34)** (Invited Paper)
Paddy Hayden, C. Fallon, T. J. Kelly and J. T. Costello
School of Physical Sciences/National Centre for Plasma Science and Technology, Dublin City University, Glasnevin, Dublin 9, Ireland

**Highlights from a Recent BEUV Source Workshop (September 26, 2012, Japan) (S12)**
Takeshi Higashiguchi
Utsunomiya University

**Concept Study on an Accelerator based Source for 6.x nm Lithography (S16)**
Udo Dinger¹, Diana Tuerke¹, Atoosa Meseck², Michael Patra¹, Erik Sohmen¹, Andreas Jankowiak²

¹ Carl Zeiss SMT GmbH, Rudolf – Eber – Straße 2, 73447 Oberkochen
² Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, Hahn-Meitner-Platz 1, 14109 Berlin
Session 12: XUV and Applications

Session Co-Chairs: Ladislav Pina (RIT-Europe) and Rainer Lebert (Bruker)

High-brightness Liquid-jet Laser-plasma Enabling 10-second-exposure Water-window Cryo Microscopy (S43) (Invited Paper)
M. Selin\textsuperscript{1}, D. H. Martz\textsuperscript{1}, O. von Hofsten\textsuperscript{1}, E. Fogelquist\textsuperscript{1}, A. Holmberg\textsuperscript{1}, U. Vogt\textsuperscript{1}, H. Legall\textsuperscript{2}, G. Blobel\textsuperscript{2}, C. Seim\textsuperscript{3}, H. Stiel\textsuperscript{2}, and H. M. Hertz\textsuperscript{1}
\textsuperscript{1}Biomedical and X-Ray Physics, Dept. of Applied Physics, KTH Royal Inst. of Technology/Albanova, 10691 Stockholm, Sweden
\textsuperscript{2}Max-Born-Institut, Max-Born-Straße 2A, 12489 Berlin, Germany
\textsuperscript{3}Institute of Optics and Atomic Physics - Analytical X-ray physics, Technische Universität Berlin, 10623 Berlin, Germany

Whole Cell Cryogenic Soft X-ray Tomography with a Laboratory Light Source (S21) (Invited Paper)
D.B. Carlson\textsuperscript{1}, J. Gelb\textsuperscript{2}, V. Palshin\textsuperscript{2} and J.E. Evans\textsuperscript{1,3,*}
\textsuperscript{1}Dept. of Molecular and Cellular Biology, University of California at Davis, Davis, CA, USA
\textsuperscript{2}Xradia, Inc., Pleasanton, CA, USA
\textsuperscript{3}Pacific Northwest National Lab, Environmental Molecular Sciences Lab, Richland, WA, USA

Capillary Plasma Radiation Source in the Soft X-Ray Region (S17)
Pavel Vrba\textsuperscript{1}, Miroslava Vrbova\textsuperscript{2}, Sergey V. Zakharov\textsuperscript{3}, Vasily S. Zakharov\textsuperscript{3,4}
Alexandr Jancarek\textsuperscript{5}, Michal Nevrkla\textsuperscript{5}
\textsuperscript{1}Institute of Plasma Physics, Academy of Sciences, 182 00 Prague 8, Czech Republic
\textsuperscript{2}Czech Technical University, Faculty of Biomedical Engineering, 272 01 Kladno, Czech Republic
\textsuperscript{3}EPPRA sas, Villebon / Yvette, France
\textsuperscript{4}KIAM RAS, Moscow, Russia
\textsuperscript{5}Czech Technical University, Faculty of Nuclear Sci. and Phys. Engineering, 115 19 Prague 1, Czech Republic

XUV and EUV Applications with EUV Sources for Metrology (S46) (Invited Paper)
Rainer Lebert, Thomas Mißalla, Azadeh Farahzadi, Christoph Phiesel,
Urs Wiesemann, and Wolfgang Diete
Bruker Advanced Supercon GmbH, Waltherstrasse 49-51, 51069 Köln-Dellbrück, Germany
12:40 PM Workshop Summary and Announcements

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

1:00 PM Workshop Adjourned