Proposed List of Topics -2021 Source Workshop

(Update July 13, 2021. Please visit www.euvlitho.com for latest information about the Source Workshop)

1.1 Blue-X photon sources with wavelength less than 13.5 nm upto water-window region for Lithography

Blue -x sources to allow continued extension of optical projection lithography for continuation of Moore's Law, via further reduction of wavelength between 13.5 and water-window region. Papers on LPP, DPP and HHG are welcome. Authors are expected to focus on power scaling to hundreds of watts, conversion efficiency and commercial viability of the technology. Additional focus is on new drive lasers, for example, solid state thulium lasers with 2 microns wavelength.

Multi-Layer (ML) and Grazing angle (GI) optics in this Blue-X wavelength region to support above mentioned photon sources.

1.2. XUV / Water window sources (~1 nm- 100 nm / 10 eV to 1 keV) for Metrology

XUV Sources (plasma and non-plasma sources, incoherent and coherent sources) and its development status (power, brightness, wavelength region, repetition frequency, cost of ownership, lifetime, commercial readiness)

Collector optics for XUV sources (GI and ML)

Spectral purity filters and debris mitigation

Optics for XUV metrology (normal and grazing angle optics, filters, and gratings)

Detectors for XUV metrology

XUV metrology applications including water window microscopy, applications supporting EUV etc.

2. Code – Comparison – modelling of Sn LPP sources with drive laser wavelengths between 1 – 10 microns.

Modelling of LPP plasmas (Hydrogen and Tin plasma) and comparison of models, methods and fundamental data for modelling. Please review problem statements to be published on the website for details. If you need further information on participation in the code comparison, please contact us at info@euvlitho.com

3. Power scaling of High Power EUV sources (500-1000 W) to support extension of EUV Lithography beyond 3 nm node

Power scaling of plasma based EUV sources:

Power scaling and pulse shaping of CO_2 lasers

Power scaling and pulse shaping of pre-pulse ps lasers

Innovative tin fuel delivery systems, including mist targets and beyond

Debris mitigation systems (ionic and neutral debris)

Designs to improve collector lifetime via active and passive debris mitigation including in-situ cleaning and debris mitigation

Technologies for filtering out-of-band (OOB) radiation at UV, IR and 10.6 microns wavelengths including spectral purity filters, coatings and new multilayer (ML) collector designs

Development of new metrology techniques and tools to support power scaling

Development of new modelling tools to support power scaling (e.g., modelling of plasma sources and its interaction with source components) including analytical theory

Generation of precise fundamental atomic data to further improve modelling

13.5 nm FEL sources as alternate high-power EUV sources for EUVL scanners

Review of current FEL designs to support EUVL power requirements of 500 - 1000 W

Innovative designs to address current challenges of FEL to support EUVL

Characteristics of FEL sources (brightness, power, source size, repetition frequency, techniques for altering coherence, footprint and cost of ownership)

Optics for FEL sources - challenges and innovative designs to address optics damage and lithography requirements

Economics of FEL sources – Cost of ownership (footprint, cost of source and cost of operation), time-lines for technology readiness and R&D funding requirements

4. 13.5 nm laser produced plasma (LPP) sources of 250-500 W to support high volume manufacturing (HVM) scanners

Update on performance of high power EUV Sources (Sn LPP)

Approaches to increase uptime of current Sn LPP sources to >90%

New experimental and theoretical methods to further the understanding of Sn LPP

Experimental and theoretical efforts to improve conversion efficiency (CE) to predicted theoretical maximum value (Currently 8%)

Refurbishment of multi-layer collectors for LPP sources

Metrology techniques to support increasing source performance and uptime

CO_2 laser amplifiers for 250-500 W sources

Modelling of sources, collectors and its components to improve source uptime, including analytical theory

Generation of more precise fundamental atomic data to support modelling

Synchrotron based metrology for HVM source collectors, filters, sensors and detectors

5. EUV Source for Metrology: Mask Defect Metrology, Pellicle Metrology and Metrology to support EUVL R&D and Manufacturing

Development status of sources to support EUV mask defect metrology (LPP, DPP, HHG etc.) and pellicle inspection

New source designs to support mask defect metrology and mask pellicle inspection tools

Source brightness requirements for next-generation EUV mask defect metrology tools

Limits of brightness for LPP and DPP mask defect metrology sources

Hybrid sources for mask defect metrology (e.g., LDP sources)

Spectral purity filters for metrology sources

Debris mitigation strategies for metrology sources

6. Broad-band (BB) EUV Sources for Advanced Metrology

Methods for generation of broad-band EUV light for advanced metrology applications

Requirements and Characterization of broad-band EUV sources

Applications of broad-band EUV sources

7. Lasers for supporting EUV and XUV Sources and Advanced Semiconductor Manufacturing at 3 nm node and beyond

Requirements, new designs (compact), development and status of lasers for following applications:

High power EUV Sources (CO_2 lasers / YAG / Thulium lasers)

Pre-pulse lasers for high power EUV Sources

LPP and DPP metrology sources

FEL sources (13.5 nm)

Broad-band EUV sources

Metrology Applications in advanced semiconductor manufacturing