

Target of the workshop

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Key word of the target on the previous workshop

Challenges for future lithography (from the report of IRDS)

<https://irds.ieee.org/editions/2022/irds%E2%84%A2-2022-lithography>

Table LITH-4 The Key Challenges of High-NA EUV Lithography

Key challenges
Resists meeting resolution requirements, with low levels of defects from stochastic phenomena and pattern collapse
Light sources that can support photon shot noise and productivity requirements
Solutions for meeting small depths-of-focus at 0.55 NA
Polarization control for maintaining high contrast at 0.55 NA
Computational lithography capabilities
Mask making and metrology infrastructure
Solutions for large dies
Cost of high-NA EUV lithography

Table LITH-2 Potential Solutions for Leading-Edge Logic Lithography

	2022	2025	2028	2031	2034	2037
Logic node	3 nm	2.1 nm	1.5 nm	1.0 nm	0.7 nm	0.5 nm
Node	G48M24	G45M20	G42M16	G40M16T2	G38M16T4	G38M16T6
Minimum ½-pitch	12 nm	10	8 nm	8 nm	8 nm	8 nm
Primary options for logic	EUV 0.33.NA multiple patterning	EUV 0.55.NA multiple patterning	EUV 0.55.NA single patterning	EUV 0.55.NA single patterning	EUV 0.55.NA single patterning	EUV 0.55.NA single patterning
Potential solutions for cost reduction, LER reduction		Optical + DSA EUV + DSA	Optical + DSA EUV + DSA	Optical + DSA EUV + DSA	Optical + DSA EUV + DSA	Optical + DSA EUV + DSA

- Beyond EUV -> wavelength tunability
- To avoid stochastics -> Higher-power
- Polarization control
- Cost reduction for exposure system

The target of the present Workshop

- **It is an essential point to hear an end user's demands and visions.**

→ Keynote lecture by Dr. Kazunari Ishimaru (Rapidus Corporation)

“The Future of Semiconductor Manufacturing: New Developments in Speed and Innovation”

- **How is the present status about the development for high power EUV sources in a world?**

→ Invited talks by Dr. Erik R. Hosler (xLight, Inc.), Prof. Shinichiro Michizono (KEK) for accelerator based light sources and Prof. Hakaru Mizoguchi et.al. (Kyushu University) for upgraded LPP light source.

- **Is there any Issues by using EUV-FEL, even though the EUV-FEL has a satisfactory performance for the key words at the previous workshop?**

→ Invited talks by Dr. Dr. Patrick P. Naulleau (EUV Tech Inc. ,and LBNL) for coherence reduction and Dr. Hisataka Takenaka (TOYAMA Co., Ltd.) for multilayer mirrors for BEUV lithography.

We hope that you will understand much more deeply about the solutions and/or issues for the above items in this workshop.