
Report on the International EUVL Source Workshop

San Francisco, CA

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Sponsored by **International Sematech**

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Consensus* Commercial Source Requirements

Attribute	2005-2006 Commercial Tool
Central Wavelength (nm)	13-14
EUV power captured by condenser in 2% BW (W)¹	50-150
Source-induced condenser lifetime at full power and 5 kHz	1 yr or 1.6×10^{11} pulses
Etendue (mm²str)	0.4 - 0.8
Repetition Rate (Hz)	>5000
Pulse-to-pulse repeatability at 5 kHz and nom. Scan speed	<2% 3σ

*** ASML, Canon, Nikon, Ultratech Stepper, SVG Lithography**

¹ Corresponding to 80 - 300 mm wafers/hr with 5 mJ/cm² resist

Workshop Objectives

- 1) Establish worldwide status of EUVL source development as measured against consensus commercial source requirements.
- 2) Identify key development risks, needs and opportunities for commercially viable EUVL source(s).
- 3) Foster the formation of partnerships/consortia for accelerating EUVL source progress.

The workshop is successful if paths are identified to help accelerate the development and commercialization of EUVL sources meeting commercial EUVL tool requirements by 2005

Workshop Objectives

The objective is NOT to recommend a down-selection from among the source development efforts represented today.

Workshop Groundrules

What will NOT be discussed:

- **Politics**
- **Program management**
- **Confidential plans or technology**

Agenda

- 8:00 Greetings and meeting objectives – G. Kubiak, Sandia
- 8:05 Overview of source requirements – V. Banine, ASML

- 8:30 Sources of Lambda Physik with partners – Guido Schriever, Lambda Physik.
- 9:00 Z-Pinch plasma – M. McGeoch, Plex LLC.
- 9:30 Dense Plasma Focus – W. Partlo, Cymer.
- 10:00 Capillary Discharge – G. Kubiak, Sandia National Laboratories
- 10:30 Break
- 10:50 Laser-Produced plasma – D. Moyer, TRW.
- 11:20 Laser-Produced plasma – M. Schmidt, CEA.
- 11:50 Laser-Produced plasma – A. Todd, AES.
- 12:20 EUVL Light Source development in Japan – K. Hotta (Ushio) and H. Mizoguchi (Komatsu)

- 1:00 Lunch – Panel convenes to review material and prepare recommendations

- 3:00 Panel discussion of source development prospects, commercialization and system trade-offs – Intl. Sematech
Panelists – Mr. Neil Wester (Chair – Intl. Sematech), Dr. Vadim Banine (ASML), Dr. Fred Bijkerk (FOM, Rijnhuizen), Mr. Robert Harned (SVG Lithography), Dr. Scott Hector (Motorola), Prof. Howard Milchberg (Univ. of Maryland), Dr. Katsuhiko Murakami (Nikon), Prof. Jorge Rocca (Colorado State Univ.), Ms. Melissa Shell (Intel)

- 4:30 Wrap-up
- 5:00 Adjourn

Overview EUVL Source Workshop - Oct. 16

Panel observations and recommendations

- Highest risk area for source is 100-150 W EUV power, followed by lifetime and CoO.
- Good progress is being made, but must be accelerated.
- While system improvements (resist, mirrors, etc.) must continue to be pursued, source developers should not expect much relief here.
- Engage fundamental EUV source research recourses better - coordinated University research can be done in parallel
- “Flying Circus” measurements were very valuable, allowing source R&D community to approach a common measurement standard and to more clearly understand qualitative differences between sources.
- Too early to down-select.

Overview of EUVL Source Workshop (Cont.)

Panel observations and recommendations

- **Source alpha units producing 10-20 W available in 2003 will be a very valuable entry point.**
- **Several challenges (debris, thermal management) are common to many sources - better collaboration to achieve common solutions needed to speed progress.**

Overview of EUVL Source Workshop (Cont.)

Source developer observations

- **Source developer consensus is that 100-150 W source is biggest challenge, but not impossible**
- **Prof. Jorge Rocca: “I firmly believe that a 150 W source with good CoO will be available within 10 yrs...but not 2-3”**