

MEDEA ExCITe Status

March 3rd, 2005; San Jose, CA

IEUVI Resist TWG

W. D. Domke



Never stop thinking.

WP 1: EUV Resist Technology Cooperation

EXCITE

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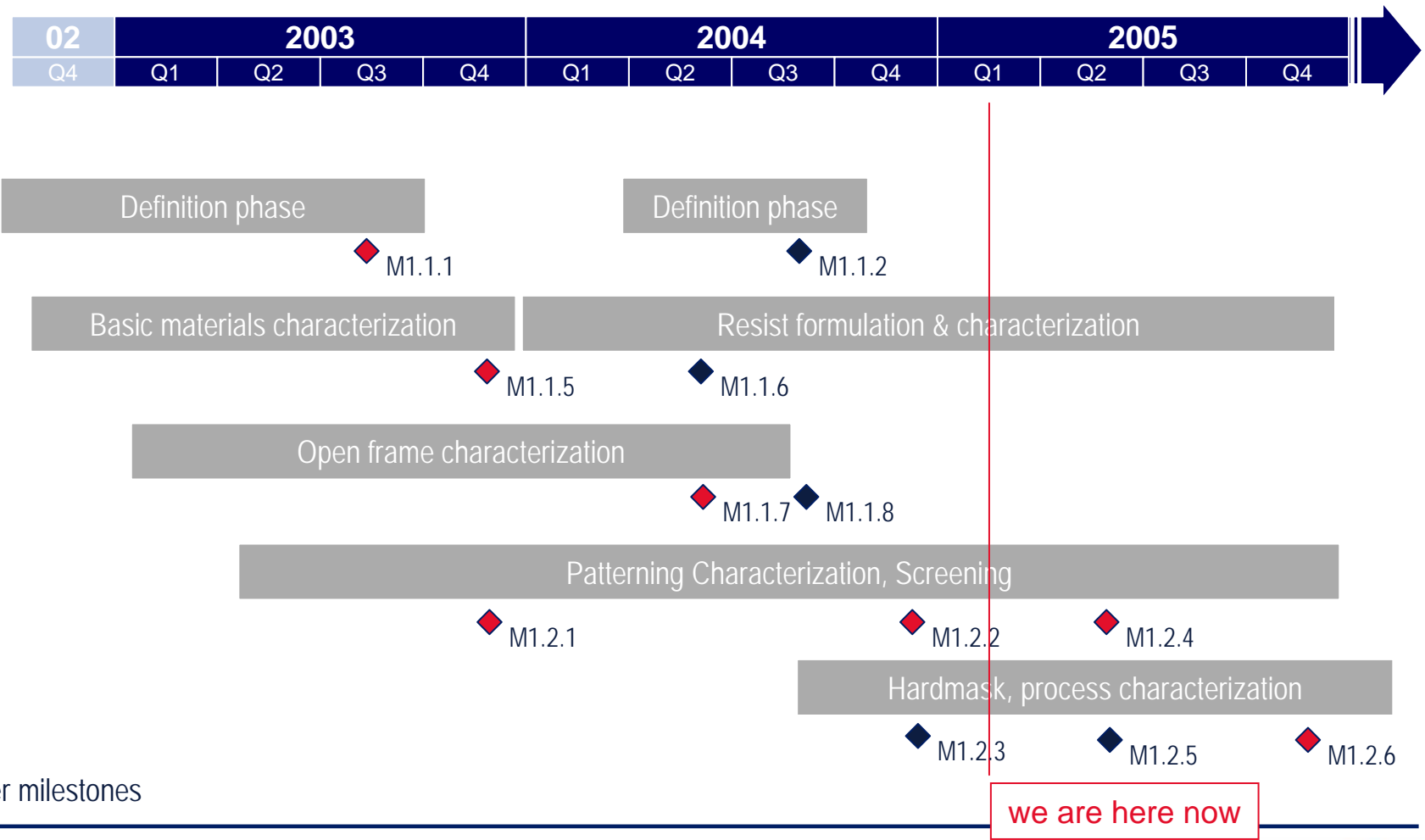
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WP 1: EUV Resist Technology

Status and Results

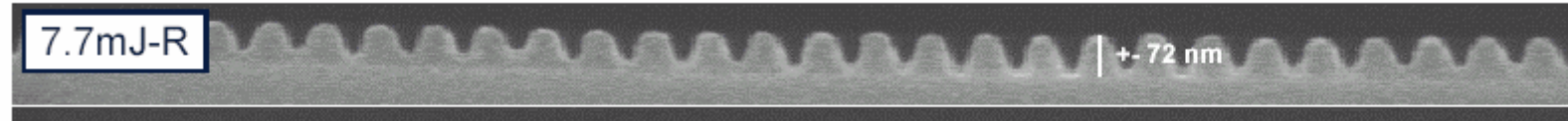
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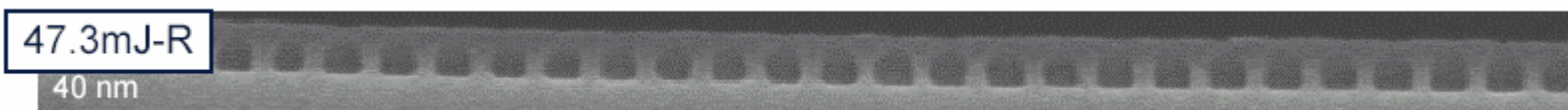
WP 1: EUV Resist Technology Highlights

Resist Performance Screening by EUV Interference Lithography: Resolution no longer limited by tool, but by resist

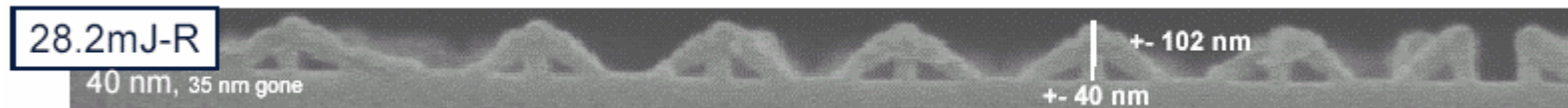
Resist A (Supplier A)
7.7 mJ; 40 nm



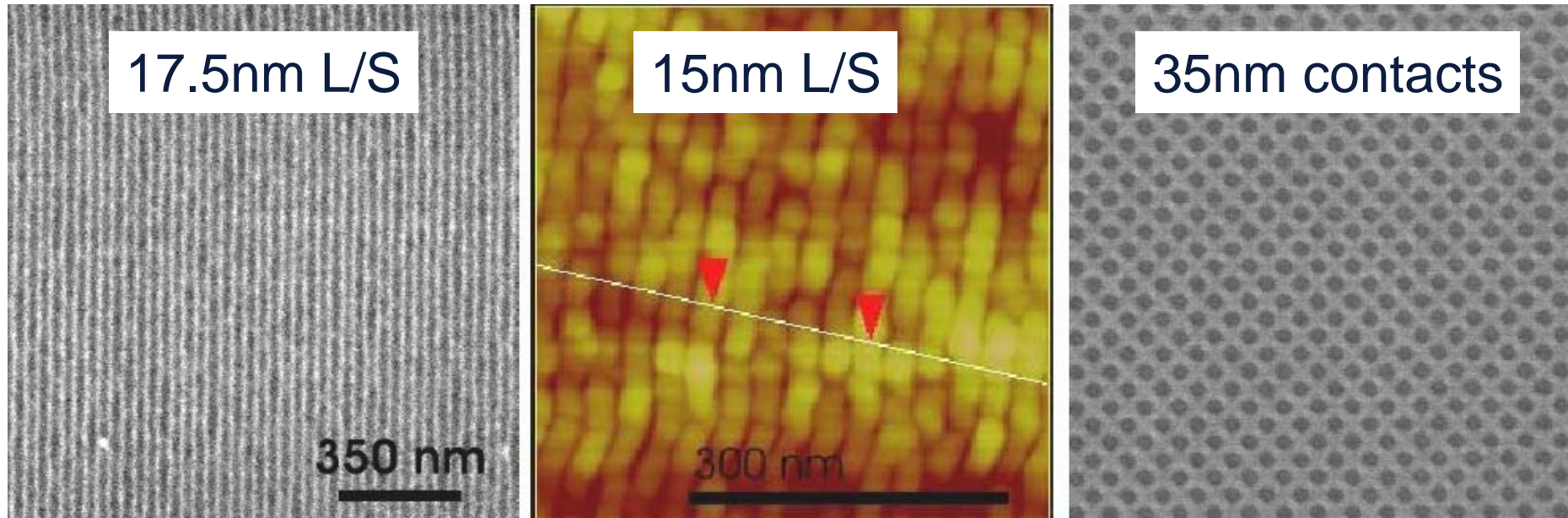
Resist G (Supplier B);
47.3 mJ; 40 nm



Resist J (Supplier C);
28.2 mJ; 40 nm



PMMA (non-CA resist) imaging at PSI



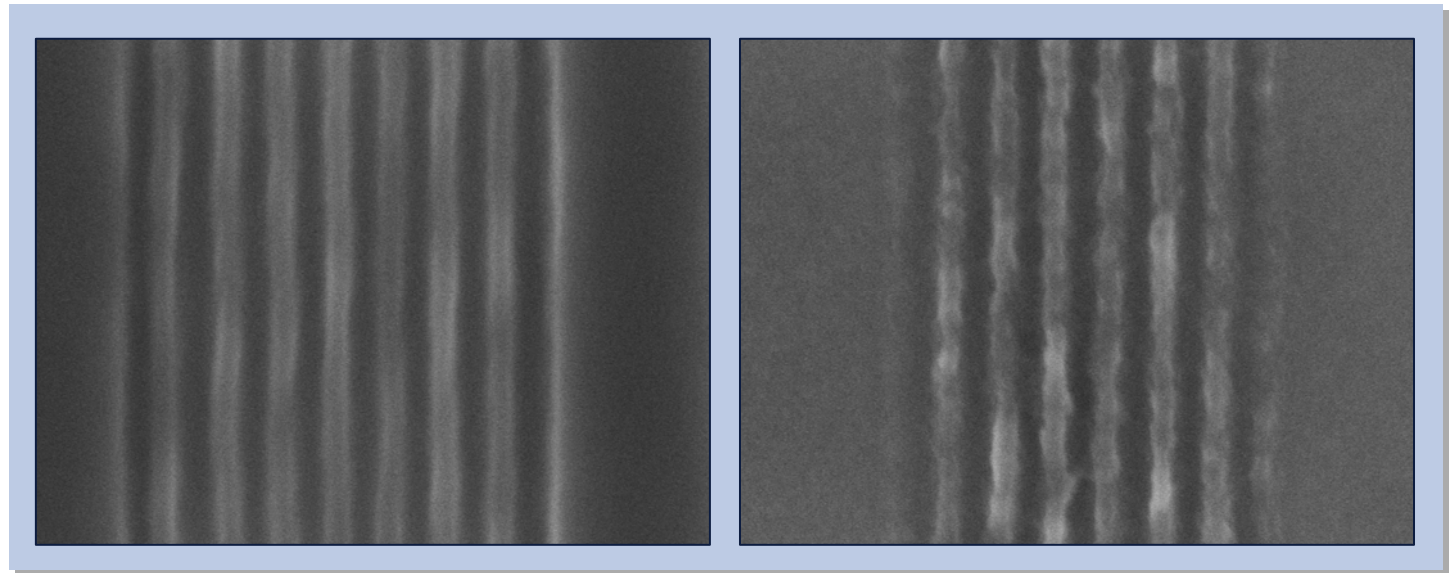
Best resolution obtained with optical lithography so far

WP 1: EUV Resist Technology Highlights



■ 0.3 NA Patterning Experiments:

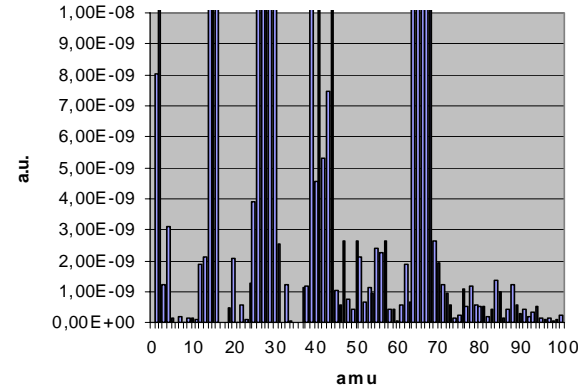
Flare has a dramatic impact on LER



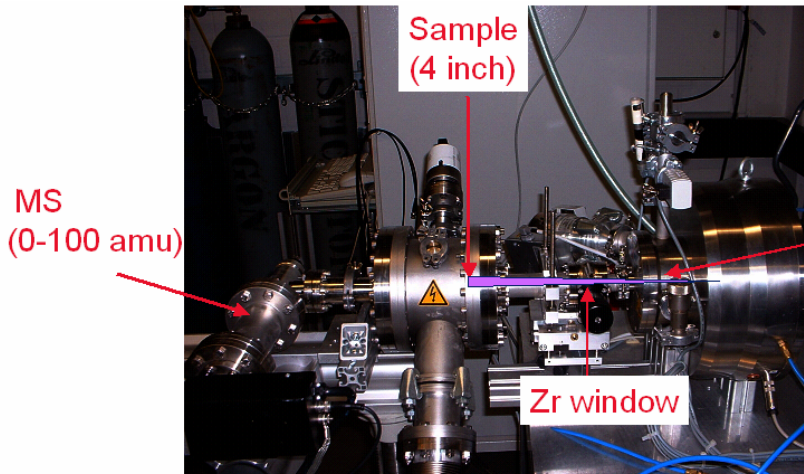
35nm L/S in MET-2D, left: dark field mask, right: bright field mask

WP 1: EUV Resist Technology Highlights

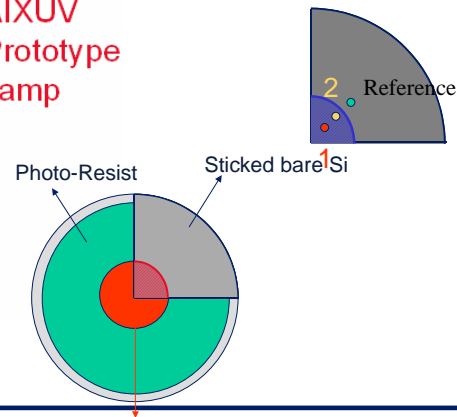
Online MS and proofplate method installed at Leti; first EUV resist outgassing results available



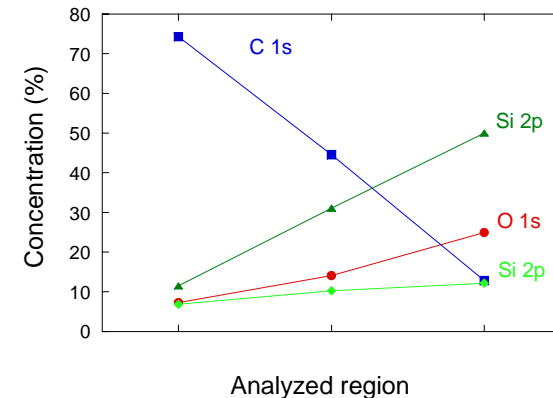
ESCAP (UV5) MS spectrum



AIXUV Prototype lamp

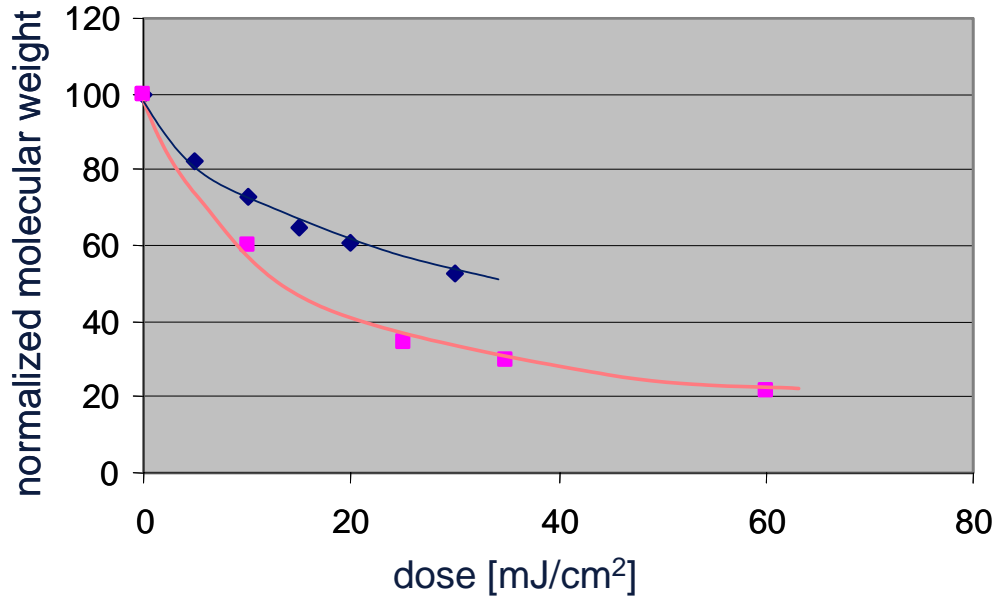


Exposed region : $\varnothing=38$ mm



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Polymers with high tendency to chain scissioning show the most outgassing

◆ Mw (157)
 ■ Mw (EUV)

acrylic model resists show more chain scissioning in EUV compared to even 157nm.

Outgassing at EUV of different polymer platforms vary by 3 orders of magnitude, DUV resists show less outgassing than 193nm resists.

ESCAP resist shows dose-dependent scissioning / crosslinking behavior

Quantitation of total outgassing [molecules/cm2 sec]

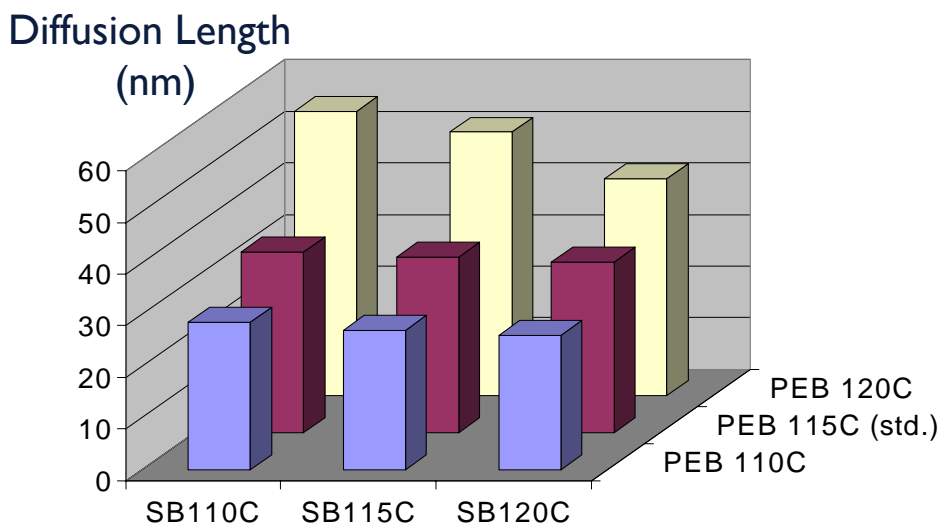
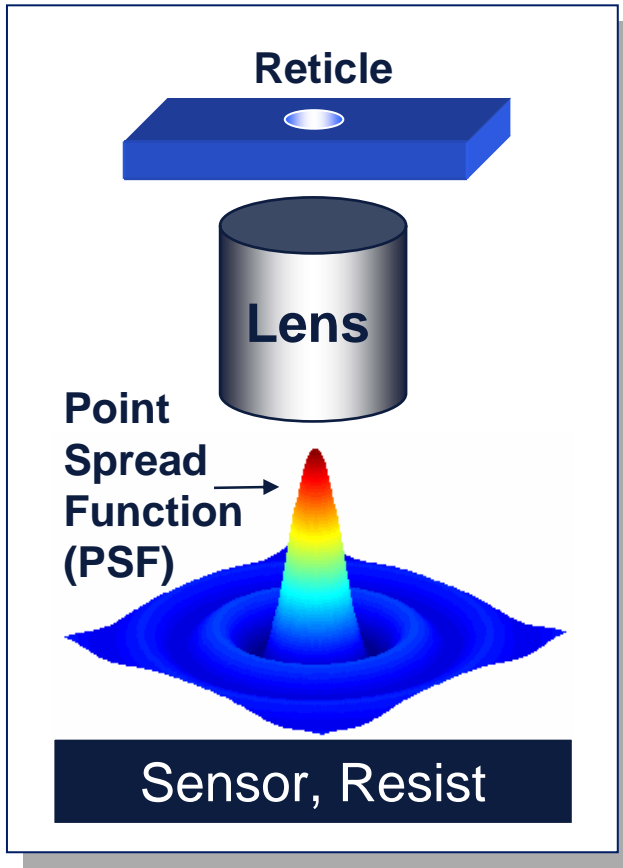
	@ EUV	@ 193nm
ESCAP	5 E+11	2 E+11
PHOST	3 E+12	1 E+12
POSS	1 E+13	
COMA-Si	2 E+13	
ACR-MA	3 E+14	6 E+12

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Method of diffused point-spread function developed and used for determination of resist diffusion limitations



Diffusion lengths are correlated to LER



WP 1: EUV Resist Technology Highlights

- MET and Interference Exposures worldwide successfully started. **Resolution is limited by the resists**, no longer by the tools
- Resist is ranked **#3 top critical issue** (Miyazaki, Nov 2004)
- MEDEA ExCITe interactions with Sematech and IEUVI Resist TWG is being used to constantly update the EUV resist process specifications
- **Top #3 roadblocks for Resists:**
 - Understanding and optimization of Photospeed, Line Edge Roughness and Shot Noise
 - Understanding of the Resolution Limits of Chemically Amplified Resists
 - What is a safe level of Resist Outgassing?
- European **Workshop on Resist Limitations** was set-up to address the resist roadblocks and to initiate international activities (Sematech, SPIE 2005)

1st European Workshop on Resist Limitations

Date & Location:

December 14th, 2004
Erlangen, GERMANY

Program Draft

User's Litho
Tool

Organization:

Michael Sebald, Infineon
Wolf-Dieter Domke; Infineon
Peter Zandbergen, Philips

Scope of Workshop:

discussion and ranking
mental resist lim
to sub-50
sari
Examples and Outlook
and Ranking in Breakout Sessions

Expected Outcome:

resist nodes,
for future resist work,
con issues to be presented
at ISM workshop in 2005

Participants:

members of MEDEA ExCITE and
on personal invitation
(max. 3 participants/company)

Global Cooperation to overcome Resist Roadblocks



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