



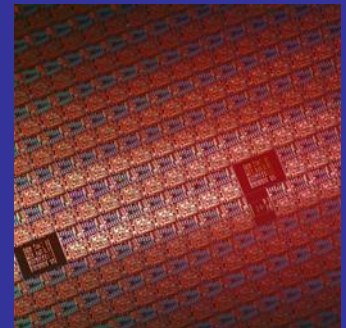
Accelerating the next technology revolution

iEUVi Mask TWG

October 6, 2013, Toyama, JP

Organizing Committee:

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Frank Goodwin, Pawitter Mangat, Obert Wood,
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EUV Focus Areas 2008-2012:

22 nm half-pitch insertion target



2008 / 22hp	2009 / 22hp	2010 / 22hp	2011 / 22hp	2012 / 22hp
1. Long-term source operation with 100 W at IF and 5MJ/day	1. Mask yield & defect inspection/review infrastructure	1. Mask yield & defect inspection/review infrastructure	1. Long-term reliable source operation with 200 W at IF*	1. Long-term reliable source operation with a. 200 W at IF in 2014 b. 500 W-1,000 W in 2016
2. Defect free masks through lifecycle & inspection/review infrastructure	2. Long-term reliable source operation with 200 W at IF	1. Long-term reliable source operation with 200 W at IF	2. Mask yield & defect inspection/review infrastructure	2. Mask yield & defect inspection/review infrastructure
3. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously	2. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously	3. Resist resolution, sensitivity & LER met simultaneously
• Reticle protection during storage, handling and use	• EUVL manufacturing integration	• EUVL manufacturing integration	• EUVL manufacturing integration	• EUVL manufacturing integration
• Projection / illuminator optics and mask lifetime				

2012 International EUVL Symposium Steering Committee

Updated ITRS Lithography Challenges (2013 LITH1)



Table LITH1 Lithography Difficult Challenges	
Near Term Challenges (2013–2016)	
1	Cost and cycle time of multiple patterning – especially for more than 2x
2	Process control on key parameters such as overlay, CD control, LWR with multiple patterning
3	EUV Source power
4	EUV Mask Infrastructure (defect inspection and verification, mitigation, mask lifetime) Defect free EUV mask blanks, mask availability
5	EUV resist and/or process that meets sensitivity, resolution, LER requirements
6	DSA defectivity and positional accuracy
Long Term Challenges (2017 and beyond)	
1	Higher source power for EUV
2	Higher NA EUV tool and mask implementation and infrastructure
3	DSA compatible design rules
4	EUV Extension (wavelength, mask, mirrors, resist, etc.)
5	Maskless lithography production tool demonstration
6	Inprint defectivity, throughput and OL matching
7	Metrology tool availability to key parameters such as CDU, thickness control, overlay, defect



International Technology Roadmap for Semiconductors

Mask TWG Mission & Objective



- **Mission:**

- Ready EUV mask infrastructure for high volume manufacturing (2013 – 2016)

- **Objectives:**

- Identify mask technology / infrastructure gaps for EUVL implementation
 - Highlight the gaps for industry action

Meeting Objectives



- **EUV Mask Blank**
 - Defectivity status and discussion
 - ML deposition tooling strategy
- **Blank Defect Mitigation**
 - Defect mitigation progress and strategy
- **Mask Lifetime**
 - ML capping layer reliability and improvements
 - Cleaning options for lifetime extension
 - Carrier progress and strategy
 - How well current exposure tool / carrier / protocol do vs. HVM needs
- **EUV Pellicle Progress and Strategy**
- **Mask Infrastructure**
 - Backside inspection capability
 - High NA industry workshop update
 - Standards status
 - 2013 EUVL mask ITRS revision

Round-Table Discussion



- **A chance for everyone be heard. Examples, but not limited to:**
 - Any comment you wished to make, or any question to ask, but time was limited.
 - What discussion was helpful to you.
 - What topics are both important and appropriate to discuss in future TWG.
 - Do we still need Mask TWG, as EUVL is approaching or already in competitive phase?
 - Anything you think it's important to comment here

You may pass if made at least one comment or asked one question during discussions.

IEUVI Mask TWG Agenda

October 6, 2013. Toyama, JP



		Mask TWG Agenda		
1:00 PM	1:15 PM	Introduction	Long He / SMT	1
1:15 PM	1:30 PM	Blank defect reduction progress and strategy	Frank Goodwin / SMT	2
1:30 PM	1:45 PM	ML deposition tooling strategy	Timothy Pratt / Veeco	3
1:45 PM	2:00 PM	Mask substrate/blank cleaning progress and challenges	Arun John / SMT	4
2:00 PM	2:15 PM	Fiducial mark and defect mitigation development status	Murachi Tetsunori / EIDEC	5
2:15 PM	2:30 PM	Defect mitigation strategy for HVM	Emily Gallagher / IBM	6
2:30 PM	2:45 PM	ML capping reliability assessment and improvement	Mason Jang / SMT	7
2:45 PM	3:00 PM	Cleaning technology options for EUV mask lifetime extension	Uwe Dietze / SUSS	8
3:00 PM	3:15 PM	Break		
3:15 PM	3:30 PM	EUV Carrier progress and improvement strategy	Poshin Lee / Entegris	9
3:30 PM	3:45 PM	Experiences with the "clean handling" path towards HVM	Rik Jonckheere / IMEC	10
3:45 PM	4:00 PM	EUV-pellicle progress and strategy	Jim Wiley / ASML	11
4:00 PM	4:15 PM	Backside mask inspection status	Masashi Sunako / Lasertec	12
4:15 PM	4:30 PM	Larger mask / High NA Workshop update	Patrick Kearney / SMT	13
4:30 PM	4:35 PM	EUV mask standard update	Long He	14
4:35 PM	4:50 PM	EUV Mask ITRS 2013 revision update	Long He	15
4:50 PM	5:00 PM	Round Table	All	16
5:00 PM	5:00 PM	Adjourn		

Round Table Introduction

- Please introduce yourself by identifying your ***name and affiliation.***

Friendly Reminder:
Please put your cell phone in silent mode during the workshop.