Review of May 18th TFOF Documents at NA PIC Meeting in Santa Clara, CA

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Outline

- **TFOF review**
  - Background
  - Approved/soon-to-be approved TF structure
  - EUV-SC/TF's operation: The scope
  - EUV-SC/TF's operation: The charter
  - Representative's responsibilities
  - Schedule
- **Summary of the June 29th EUV-SC/TF Teleconference**

Today's Photomask Protection

- Existing optical masks use a protective pellicle to keep particles off the pattern surface and out of the plane of focus.
- With transmissivity over 99%, the pellicle has a negligible impact on the aerial image.

Courtesy S. Hector (Freescale / SEMATECH)

Protected by Pellicle

IEUVI Mask TWG Top Technical Issues 03/02/05

Issue	Status	Progress
1. Multilayer defect density	red	*Improved but Far from need*
2. Metrology / defect inspection and potential need for actinic inspection for blanks • Optical inspection tool path to <30nm PSL (micro field optical inspection sys to prove < 30nm PSL) • Actinic inspection tool path – commercialization (yellow)	red	***PROGRESS***
3. Handling & protection of patterned masks	red	*Signif. data still needed*
4. Substrate defect density	red	***PROGRESS***
5. Mask blank and patterned mask cleaning	red	
6. Multilayer repair of phase (buried) defects	red	
7. Multilayer repair for amplitude (surface) defects	yellow	***PROGRESS***
8. Substrate flatness and thickness variation	yellow	
9. Mask chucking solution, including stress of layers and backside conductive layer requirements	yellow	
10. Patterned mask defect inspection and defect printability	yellow	

Issue list determined by IEUVI TWG with members from the NA, Europe, Asia

Status colors per ITRS
- yellow: *solution known*
- red: *no known solution*

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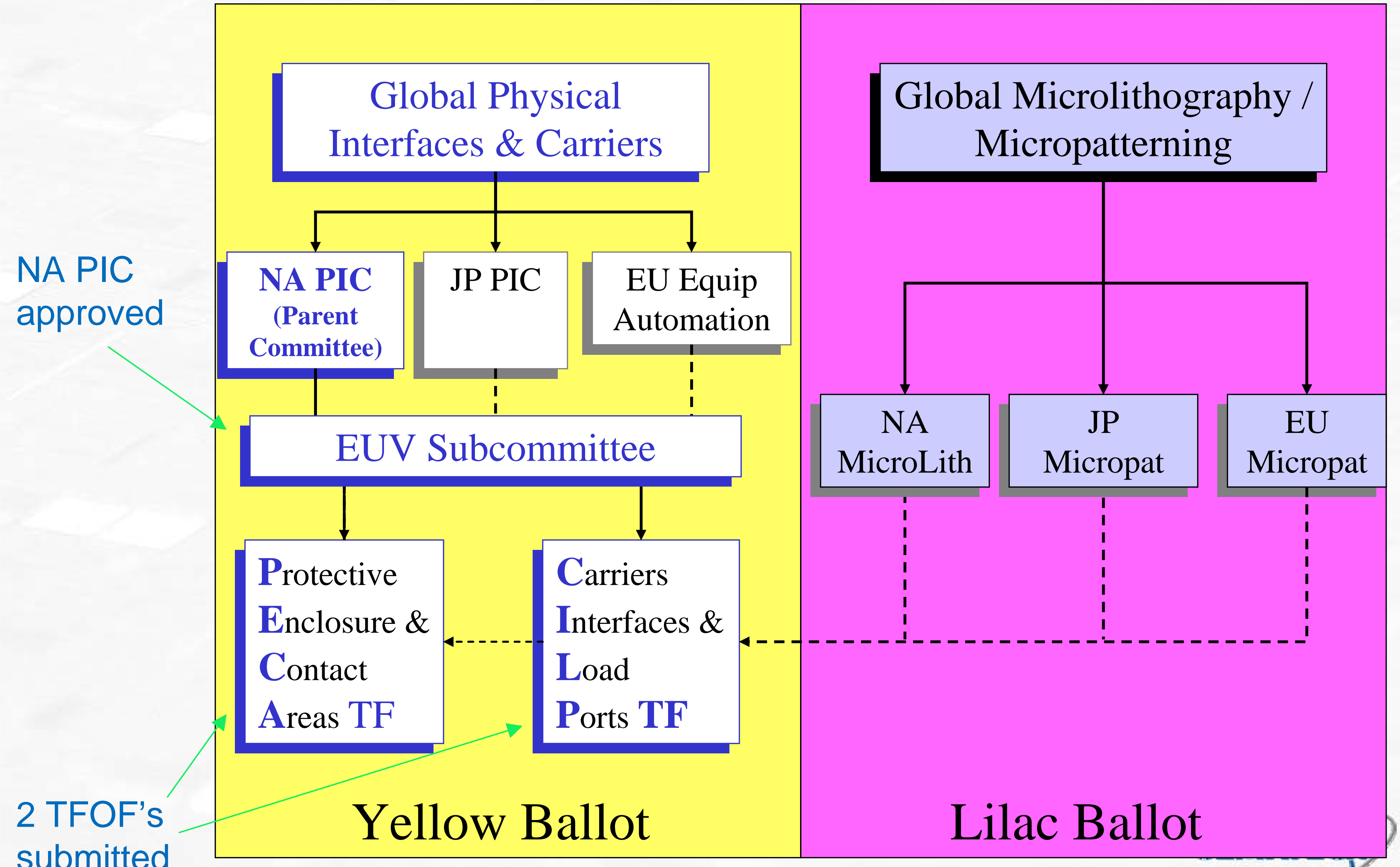
EUV Mask Protection, Carrier, Loadport, Interface Standards Subcommittee / Task Forces



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EUV- SC Purpose and Goals

Mission Statement:

To organize and institute global standardization consensus on EUV Mask Standards, through SEMI process, that support defect free EUV reticle protection and handling throughout its life cycle by Dec 2007.

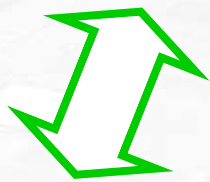
Scope:

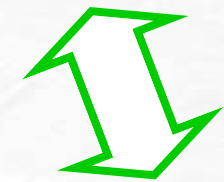
The EUV-SC organized by SEMATECH will help coordinate activities of the two Working Groups, or TF's soon to be, to successfully institute SEMI standards through voting *that is accepted globally*, which defines EUV reticle carriers and load-port interfaces, protective enclosures, exclusion zones, and common contact areas.

EUV-SC/TF’s Operations: The Charter

EUV- SC

- Schedule and conduct review and general SC/TF meetings
- Coordinate standards development and resolve dispute, or redundant between the two Task Forces
- Responsible for SEMI standards (Blue Ballot and Yellow)
- Responsible for interfacing with and submitting ballots to SEMI
- Providing guidance and support to the two Task Forces

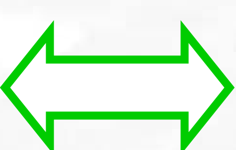




PECA TF

Develop standards for

- Protective enclosure attached to EUV reticles
- The enclosures to eliminate contamination
- Common contact points defined on the reticle, mask blank, or substrates



CILP TF

Develop standards for

- Carriers including interface, interior carriers, intra and inter FAB facility transport
- Vacuum/atmospheric molecular contamination
- Loadports, exclusion zones, other general interface needs

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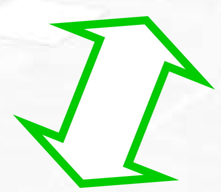
EUV-SC/TF's Operations: The Makeup

EUV- SC

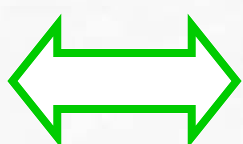
One primary representative per entity to SC, or TF's

- Phil Seidel (SEMATECH): Lead Chair
- Long He (SEMATECH): Co-Chair
- Major stakeholders (Chip mfg)
- Major Industry consortia representatives
- Major tool suppliers (exposure systems, etc)
- Parent committee: SEMI NA Physical Interface Carrier committee (NA PIC)
- The SEMI EUV-SC/TF process is *by international representations*, although it will be conducted through SEMI North American region.



PECA TF

- Long He (SEMATECH): Leader
- TBD: Co-Leader
- Major supplier / infrastructure Stakeholders
  - Mask Mfg.
  - Substrate & blank suppliers
  - Handling system suppliers
  - Exposure tool and process tool suppliers



CILP TF

- Phil Seidel (SEMATECH): Leader
- Mutaz Haddadin (Intel): Co-Leader
- Major supplier / infrastructure Stakeholders
  - Exposure tool and process tool suppliers
  - Mask Mfg.
  - Handling system suppliers
  - Substrate & blank suppliers

TF Representative's Responsibilities

- Representatives will be selected and shall *support an unbiased view* on the most effective and implementable requirements or solutions.
- Representatives will be required to *contribute both in technical input/directions and providing resource* (i.e. overhead) in the general processes.
- Representatives will be *responsible for interacting, data acquiring, and providing both input and data to the* ***CLIP/PECA TF's*** *on a routine basis.* On average it is expected that each representative shall contribute about 4~8hrs/Mon to support this effort as well as attend key Standards or Workshop meetings twice a year.
- The **CILP/PECA TF's** are *responsible for editing and submitting Blue/Yellow Ballot* to SEMI through EUV-SC

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EUV Mask Standards Schedule

- **PECA: Protective Enclosure & Contact Area**
  - Blue ballot (informational) defined Q1 2006
  - Reviewed at SEMICON West 2006 where the NA PIC for the yellow ballot results
  - NA PIC will review the process protocols review August 2006, and the standard will be drafted, edited..
  - Publication by November 2006

- **CILP: Carriers, Interface, & Load Ports**
  - Similar process as the PECA tasks above
  - Blue ballot (informational) defined Q2 2006
  - Yellow ballot completed by November 2006
  - Committee approval at SPIE in Feb. 2007
  - Publication by June 2007.

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- **Summary of the June 29th EUV-SC/TF Teleconference**

Summary of June 29th Teleconference

- Callers represented 15 companies, or organizations from NA, Europe, and Asia
- Reviewed May 18th TFOF documents
- Main comments made during discussions
  1. New standards is needed…
  2. Existing carrier is insufficient…
  3. Reticle contact areas need to be defined.
  4. Orientation of mask (facing up, or down) needs to be defined at each step.
  5. Existing SEMI standard tolerances may not be good enough and need to be looked into.
  6. Five companies commented data is important, or wanted to start more data collection

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Summary of June 29th Telecon. (cont'd)

- Main comments from discussions (cont'd)
  7. Map out where additional protection is needed, where is not, step by step for the entire reticle life cycle.
  8. Need to define detailed, incremental schedules and deliverables that lead us to final goals.
- Main questions:
  1. Contact points standard is in P40. What do we need to do there?
  2. What data exists and what additional data is needed for near terms?
  3. in-situ cleaning has been discussed for mirror surface protection. What do we do about cleaning?
  4. Outgassing/contamination requirements need to be in standards, in addition to physical/mechanical requirements. How do we balance everyone's requirements for final standards?