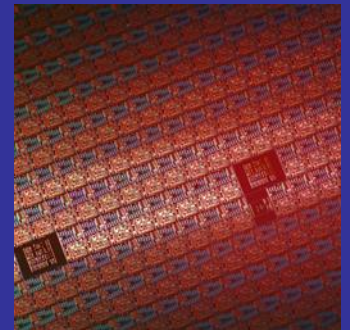




Accelerating the next technology revolution

- **Status of SEMI E152 Standard Revision**
- **Review of Last TWG Action Items**
- **Discussions**

Long He, Mask TWG, Feb 12, 2012



E152 Revision Update

E152 EUV-pod Standard is Active and Being Revised



- **Last revision ballot was voted on last October, but failed. There were four negative votes.**

1. Reject over inclusion of two optional purging ports. *(Related to revision)*
2. Reject over opinion that “....present form is too much misleading the community regarding Type A and Type B, and should be temporarily withdrawn until this is rectified.” *(Unrelated to revision)*
3. Reject over insufficient editing description. *(Related to revision)*
4. Reject over inclusion of Type-B carrier option in E152. *(Unrelated to revision)*

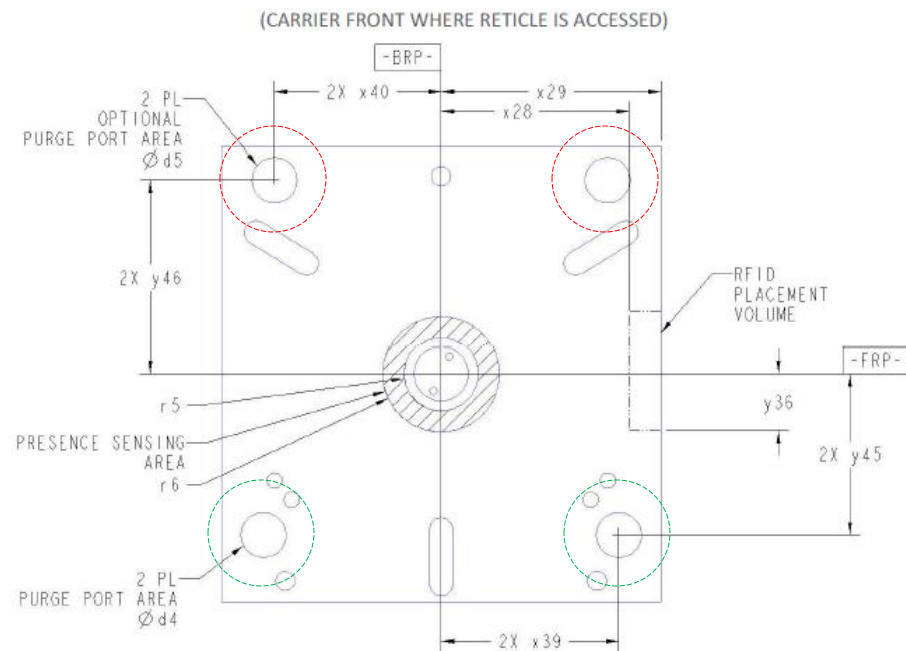


Figure 10
Bottom View of Outer Pod Door

Changes Included in Last E152 Revision Ballot



- **Additions** are primarily specified in Sections 5.10.3, 5.16, 5.17, Tables 1 and 3, and Figure 10:
 1. Two (2) primary purge port locations / areas
 2. Two (2) optional purge port locations / areas
 3. One (1) carrier presence sensing ring / area
 4. Eight (8) carrier info pad configurations
 5. Max weight increase by 0.65kg (1.43lb)
- **Improvements** are primarily made in Sections 4.2.6, 5.5, 5.10.2, Tables 1, 2 and 3, Figures 6, 9, and 10:
 6. Clarification of carrier orientation
 7. Clarification of reticle positioning on inner pod baseplate
 8. Clarification of outer pod door force and torque
 9. Clarification RFID location in outer pod door
 10. Clarification / specification of the height of OHT flange
 11. Correction of KC pin spec error
- **Those changes should be a base for next ballot.**

E152 RFID Location Spec



- The physical location of RF transponder is spec'd *inside the door and on the right hand side in the bottom-up view* as shown below.

(Front of pod/mask)

(CARRIER FRONT WHERE RETICLE IS ACCESSED)

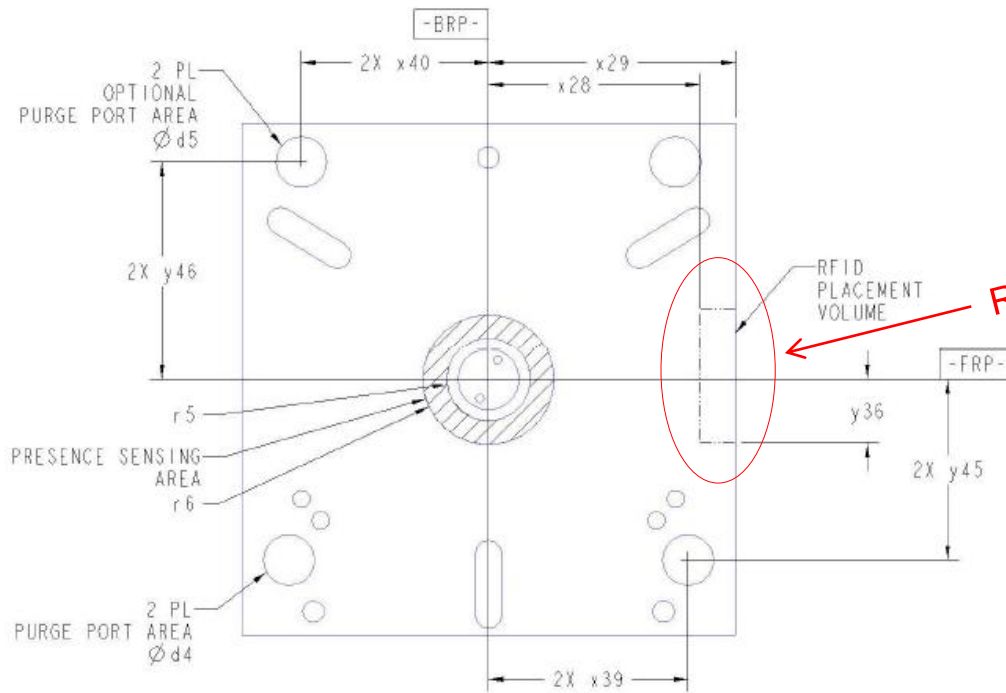
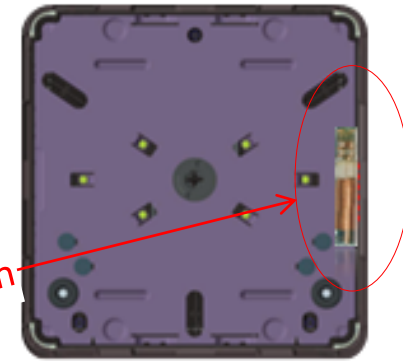


Figure 10
Bottom View of Outer Pod Door

Bottom View of Outer Pod Door as shown in upcoming E152 standard revision. The bottom view orientation is uniquely keyed to multiple futures such as “Y” shaped 3 KC pin slots, 4 info pads, and 3 carrier positioning holes

(Front of pod/mask)



Bottom View of (Entegris) Outer Pod Door.

E152 requires RF transponder is placed inside the door, on its right side as indicated in the bottom-up view (or on the left side on top-up view, not shown here)

IMPORTANT: RFID location in the currently active E152 document is correct. But, it can be misinterpreted due to insufficient figure-labeling. Improvement needed.

E152 EUV-pod Standard Status



- **TF proposes to re-ballot (E152) as a line-item ballot.**
 - Pro: focus on changes. A partial adoption is better than nothing at all.
 - Con: a lot more work... ballot must be written in the way it can still be a complete standard when some voting items disapproved.
- **Schedule: TBD**

Next TF Face-face Meeting Will be Held @SEMICON West in July



- **Next face-face EUV Reticle Handling TF meeting will be @ SEMICON West.**
 - Check SEMI Web (in April / May) for *EUV Reticle Handling TF* meeting, under SEMI North America Physical Interfaces & Carriers (NA PIC) Committee meetings
- **Standard membership:**
 - Open to the entire community
 - To attend TF meetings, SEMI rule requires to register as a Standard member.
 - To vote, one must register as a voting member.

Status Review of Action Items

TWG Handling Summary

(9/19/11 and 10/16/11 TWGs, Posted with Last TWG Material)



• Action plans, help needed to make them all actionable!

- drop** 1. Generate aPod (NXE reticle carrier) shipping data for a data-driven decision (Owners: SEMATECH/ASML/Entegris; ECD: by next TWG)
- ✓ 2. Invite HamaTech to next Mask TWG to present a data-based discussion on reticle gripping (Owner: TWG Chair)
- ✓ 3. Meet with suppliers and end-users individually to assess needs at critical steps (Owner: SEMATECH)
- open** 4. Verify substrate backside edge damages or no-damages using LTEM substrates, with all carrier types in question. (SEMATECH, *contingent on pod/LTEM availability*)
- open** 5. All carriers should be tested the same ways for comparison, since data presented appear scattered dots. (SEMATECH, *contingent on collaborations*)
- open** 6. More reticle handling data are needed and shared. (Owners: *All*)
- Focus on infra. need** 7. Prepare for molecular contamination discussion in next TWG in the areas of “after-clean” surface, during shipping, in vacuum, in-fab storage, and carrier material outgassing. (Owners, *All*)

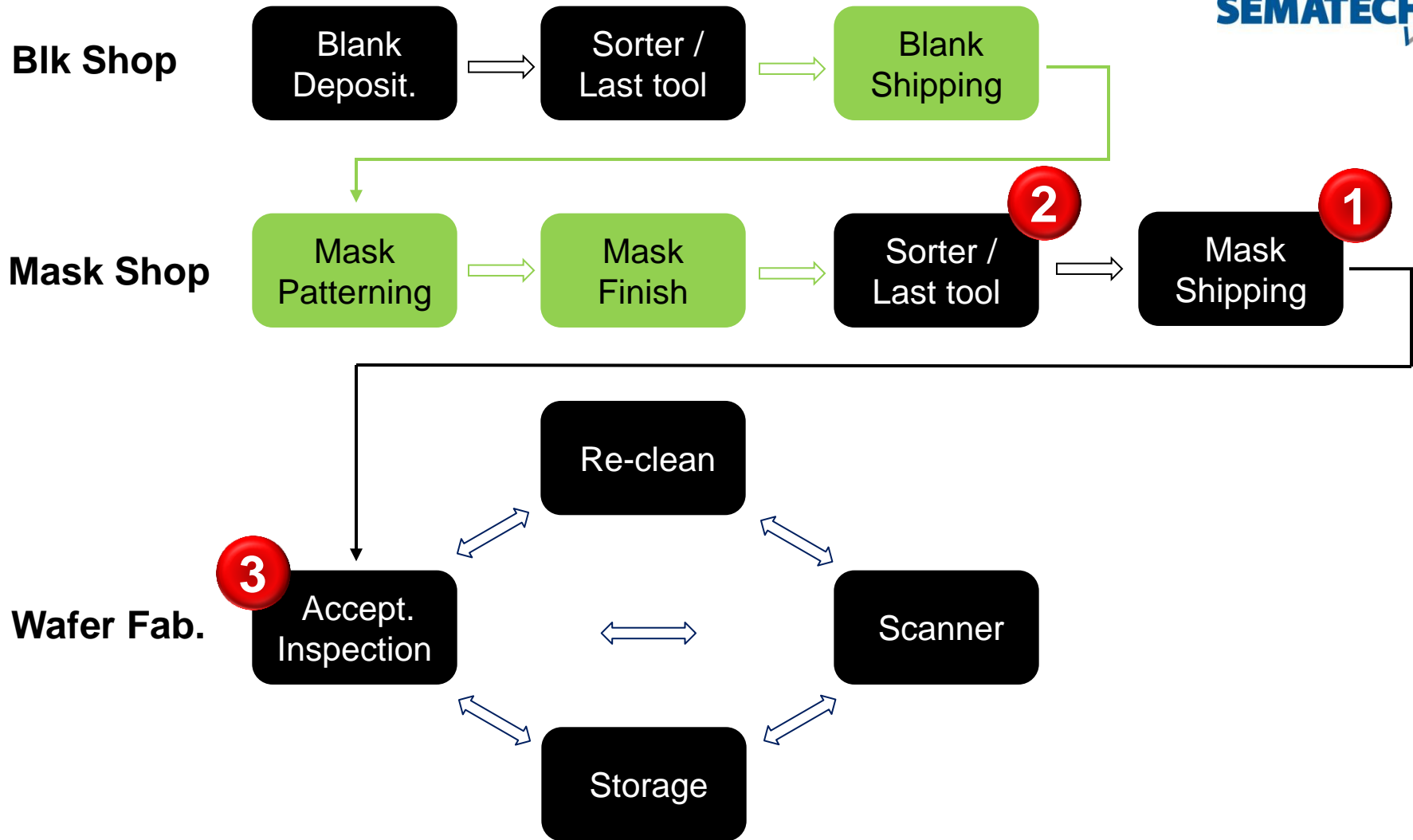
Discussions

End-users' Perspective of What they Need



	Needs	Description	Comments
→	1 Standard improvement	Improve all EUV mask related standards	Primarily carrier
→	2 Infrastructure/tool x-ship interoperability	Finalize consensus on shipping strategy, carrier type, and tool interface requirements	Between mask shops and wafer fabs
	3 Carrier benchmark	Conduct industry carrier benchmark	Data driven decision making
	4 Universal carrier solution	Develop universal carrier solution for mask handling and protection	Eliminate needs for pod swaps
	5 Carrier cleanliness qualification	Define carrier cleanliness qualification specification	Answer what particle levels are, or are not acceptable
→	6 Carrier particle inspection capability	Develop tool for carrier-particle inspection	Stand-alone or integrated with pod washer
→	7 Storage / mask surface contamination	Capability to minimize surface contamination during storage or while not in use	Lack of EUV exposure data to quantify the problem
???	8 ESD investigation	Investigate ESD, blank front-back conducting path, carrier grounding issues	Carrier, ML deposition, and P37 standard all related
???	9 Carrier outgassing requirement	Define material outgassing spec and post clean conditioning protocols	Protect mask and optics from molecular contamination
→	10 Carrier weight reduction	Lower carrier weight for ergonomics	Address HVM concerns
	11 EUV pellicle	Develop EUV pellicle	Alternative technology
	12 Multiple pod sources	Develop multiple carrier supplies	Alternative supply

A Likely Blank/Mask Flow



Proposed Blank / Mask flow: Color black indicates where EUV handling is needed; Green indicates current technology may be sufficient.

Proposal For HVM Shipping & x-Shop Interoperability



	Areas	Proposal	Requirement
1	Shipping	<p>Type-B (sPod...)</p> <p>Type-A (scanner aPod, etc.) is preferred. Implement when it's ready.</p>	<ul style="list-style-type: none"> • Acceptable particle level • Regular package services (<i>meaning no Freight services</i>)
2	Mask-shop transfer	<p>Sorter / The last tool^{#1}</p>	<p>Fully SEMI compliant (<i>implying capable of both Type A and B</i>)</p>
3	Wafer-fab acceptance	<p>Mask Inspection^{#2}</p>	<p>Fully SEMI compliant (<i>implying capable of both Type A and B</i>)</p>

^{#1} *The last tool may be user-specific, such as final clean, or final inspection, or both...*

^{#2} *Inspection until particle-free shipping capability can be routinely demonstrated. End-user defines what inspection capability is needed.*

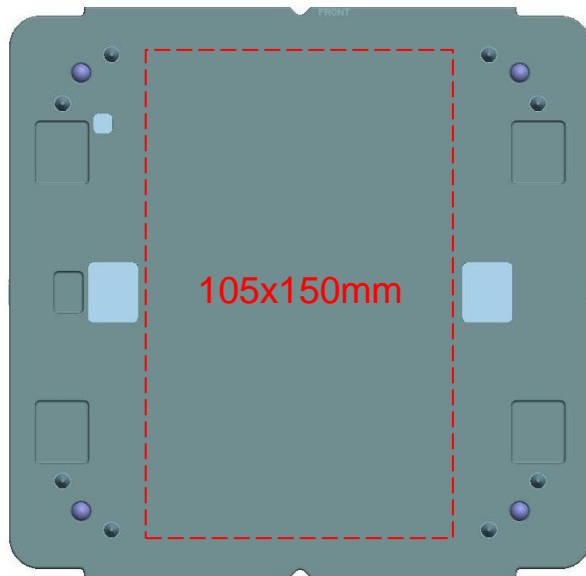
Proposal for Pod Inspection Tool (or Capability)



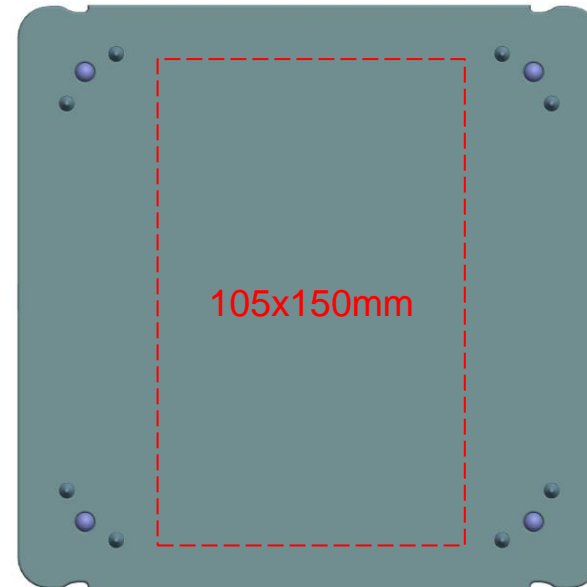
Basic requirements:

1. Pod surface inspection: central 105x152mm; 1 um sensitivity
2. Throughput: <10min
3. Cost: low

Question: Do we really need it? Requirement if we do?



Type-A baseplate



Type-B baseplate

Purging Port, How Many We Need?



- **Conflict:** some demand for two optional ports, but others say no.
- We must resolve the conflict before submitting a new ballot, or accept the inevitable outcome that the two optional ports will NOT be there.

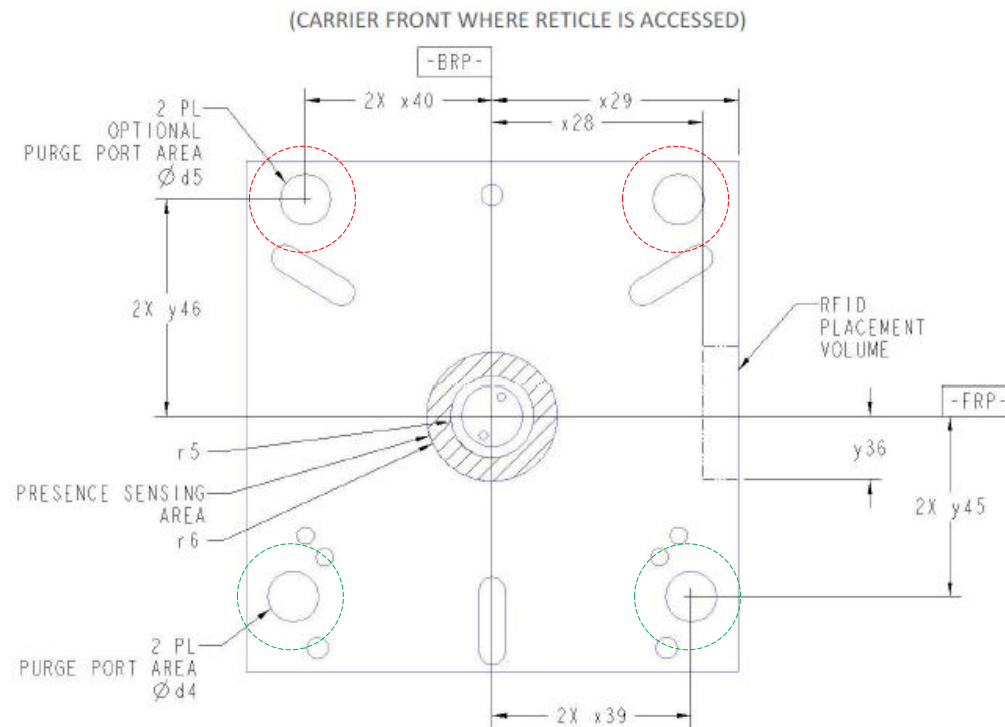


Figure 10
Bottom View of Outer Pod Door

Feb 12 Mask TWG Preliminary Agenda

Start	Finish	Topic	Who	
11:30 AM	12:30 PM	Lunch		
12:30 PM	12:45 PM	Introduction	David Chan, SMT	1
12:45 PM	12:55 PM	EUV blank defect mitigation using fiducial marks	Tetsu Murachi, EIDEC/Intel	2
12:55 PM	1:05 PM	Accuracy of EUV blank defect locationing using Teron 617 and fiducials	Uzo Okoroanyanwu, GF	3
1:05 PM	1:15 PM	Fiducial generation	Shoki Tsuomu, HOYA	4
1:15 PM	1:25 PM	Technical requirement and ebeam writer implementation plan	Yoshitake Shusuke, Nuflare	5
1:25 PM	1:45 PM	Fiducial mark / defect mitigation discussion	All	
1:45 PM	2:00 PM	Entegris carrier status update	Tom Kielbaso, Entegris	6
2:00 PM	2:15 PM	Gudeng carrier status update	Chenwei Ku, Gudeng	7
2:15 PM	2:30 PM	DMS EUV pod clean and reticle storage tool update	Lutz Rebstock, DMS	8
2:30 PM	2:45 PM	Break		
2:45 PM	3:00 PM	E152 revision status update and status of action items from last TWG	Long He, SMT/Intel	9
3:00 PM	3:45 PM	Reticle handling discussions	All	
3:45 PM	3:55 PM	EUV mask blank defect status	Vibhu Jindal, SMT	10
3:55 PM	4:10 PM	ML deposition tool characterization	Patrick Kearney, SMT	11
4:10 PM	4:25 PM	Substrate quality improvement	Teki Ranganath, SMT	12
4:25 PM	4:40 PM	Substrate prep for dep	Arun John, SMT	13
4:40 PM	4:55 PM	EUV blank discussion	All	
4:55 PM	5:00 PM	Conclusion and meeting adjourns	David Chan, SMT	