
EUVL Reticle Handling Working Group Meeting

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Project Managers/EUVL Lithography

10/17/02

EUVL Symposium, Dallas, TX

INTERNATIONAL
SEMATECH

Agenda

- **Introduction** 1:00-1:10 **Jerry Cullins**
- **Survey Results** 1:10-1:30 **Jerry Cullins**
- **Thermophoresis** 1:30-2:00 **Lennie Klebanoff**
- **Data Matrix** 2:00-2:20 **Thomas White**
- **Canon Presentation** 2:20-2:50 **Canon**
- **Break** 2:50-3:10
- **Reticle Standards** 3:10-4:00 **Scott Hector**
- **Chuckling Standards** 4:00-4:50 **Pawitter Mangat**
- **Adjourn**

Meeting Goal

- **Update on current status**
- **Share new data and ideas**
- **Present a forum for discussion and data transfer**

Working Group Charter

- **Mission Statement:**

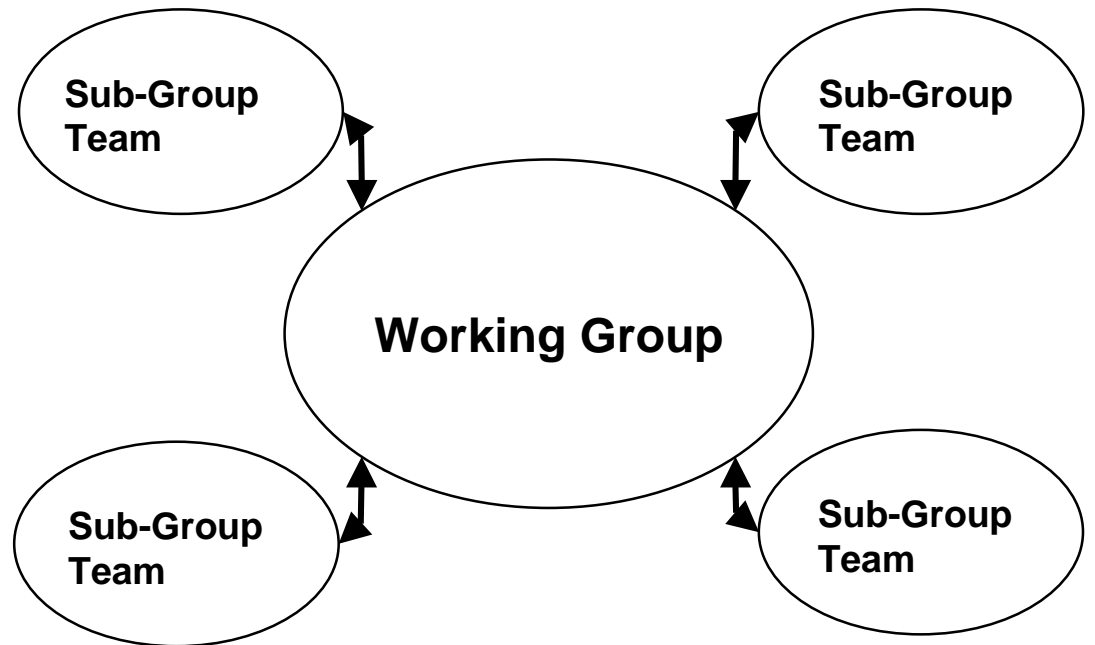
- To show that EUVL reticle handling is feasible to support beta level production by '05 and full scale manufacturing in '07.

- **Problem Statement:**

- There was no industry working group addressing the issues specific too and critical too EUVL Reticle Handling.
- Without a pellicle there is a lack of particle protection for reticles.
- With no chucking standard or particle protection for the backs of reticles, integration of solutions for reticle tools/mask manufacturers are potentially at risk.
- And finally need to integrate reticle handling for EUVL process modules.

Working Group Structure

- **Global group to provide technical guidance, steering, and status updates.**
- **Sub-groups to address specific areas of concern**
 - Suggest issues
 - Put project plans in place to address critical issues
 - Provide input on potential solutions



Meeting Structure

- **Global Group**

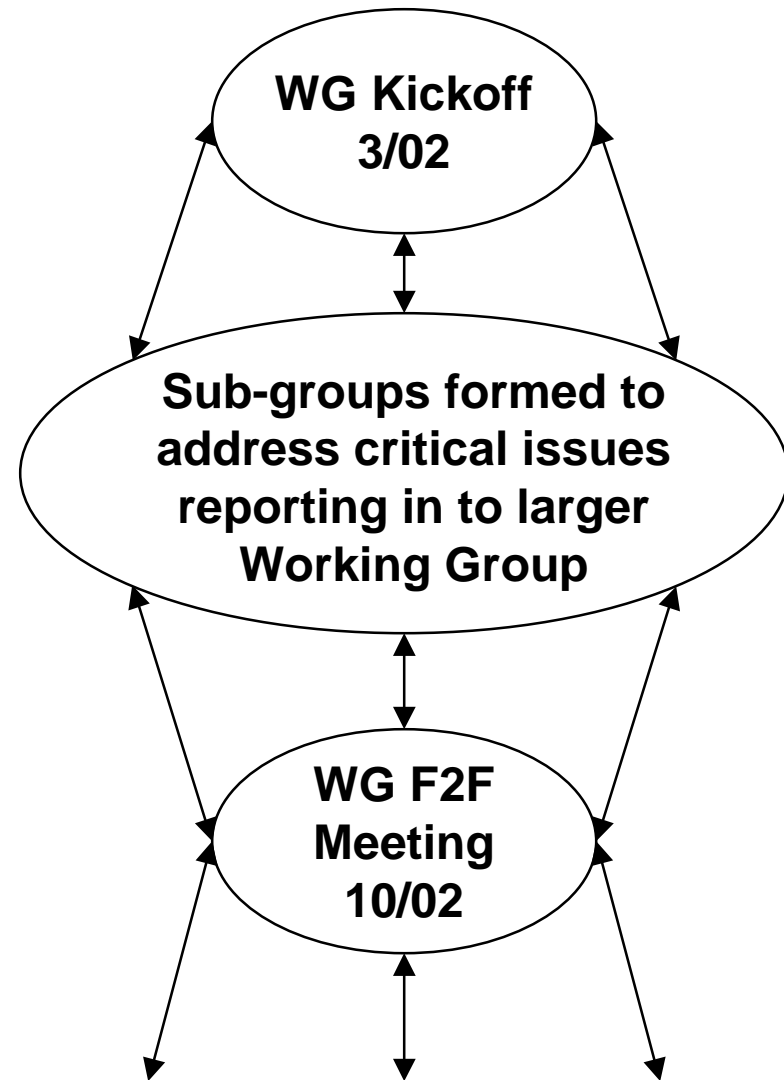
- Regular face to face meetings at industry meetings
 - SPIE 3/02
 - EUVL Symposium 10/02
- Regular teleconferences to provide input and direction and receive status updates

- **Sub-groups**

- Regular phone conferences with reports in to the global group

- **Proposed Deliverables:**

- SEMI Spec on reticle handling
- Prototypes to prove feasibility



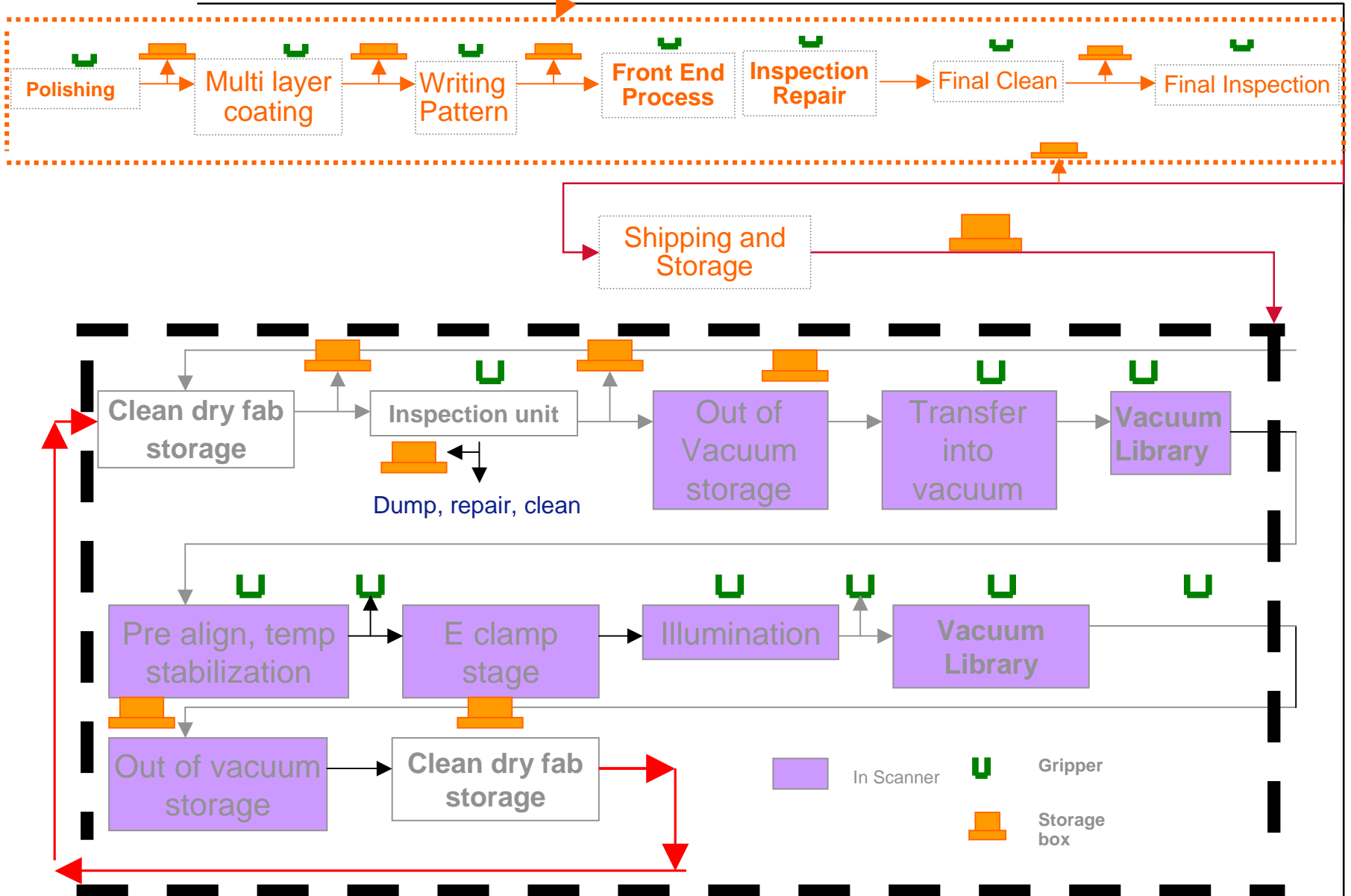
Updates/History

- **Please welcome Thomas White – new project manager for the EUVL Handling and Standards working group.**
- **3/02 first working group meeting held at SPIE in Santa Clara, CA**
- **4/02 Reticle Protection Working Group begins regular teleconferences**
- **7/02 Reticle and Chucking Standards meeting at Semicon West.**
- **10/02 Reticle and Chucking Standards meeting at EUVL Symposium**

Reticle Protection Mechanism WG

- **Goal: To standardize and recommend reticle handling BKM's to protect reticles from defects from manufacture through use.**
- **Goals for 2002 –**
 - Recommendation for handling standard for handoff from storage box to exposure tool.
 - Recommendation for environmental specification for factory/storage of reticles.
 - Reticle flow for where to focus protection efforts.

Manufacturing: once in life time



Thanks to ASML for Reticle Flow

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Reticle and Chucking Standards WGs

- **Goal: To standardize solutions to reticle handling problems in EUV through the SEMI organization.**
- **Goals for 2002 –**
 - Update and maintain the P37 specification
 - Drive consensus on chucking standard for balloting in '03.

Cleaning/Inspection WG

- **Goal: To evaluate the need for and develop if required current and novel cleaning and inspection technologies and strategies for EUV reticles.**
- **Currently no work ongoing. Plan to start in 2003.**
- **Goals for 2003 –**
 - Recommendation for cleaning and inspection protocol of reticles in the factory to best protect against avoidable repeating defects.

Survey Results

- **What gripping and handoff requirements are needed for transfer from pod to tool?**
 - Back preferable, possibly sides
 - As current inspection tools do not have facilities for vacuum or bleeding down pressurized pods atmospheric CDA is the best current choice.
 - Hopefully no line of sight from the contact points to the front side

Survey Results

- **What interior environment should storage pods have:**

- A. Dry Nitrogen 4
- B. Clean Dry Air (CDA) 2
- C. Vacuum 1
- D. Other:

- **What pressure should storage pods have:**

- A. > atmospheric 5
- B. < atmospheric
- C. Vacuum 1
- D. Other: Atmospheric 2

Survey Results

- **Should the same pod be used for:**
 - A. Storage 1
 - B. Transport
 - C. Movement around the factory/FAB only 1
 - D. Storage and Transport 2
 - E. One pod for storage, transport, use in FAB 5

- **What material should Pod be made of:**
 - A. Plastic 5
 - B. Steel 1
 - C. Other Metal (please specify): 1
 - D. Other: 1
 - Non-outgassing, conductive, acid resistant material
 - Metal is non-outgassing, AL is inexpensive, however, plastic has advantages (can be clear)
 - Steel with a transparent window

Survey Results

- **Should Pods shell be electrically conductive:**

- A. Conductive 7
- B. Insulating 1
- C. Semi-conductive
- D. Dissipative 2
- E. Grounded 1
- F. Other: A,C,D,E -

Why: Must not allow electric fields – must protect against ESD

- **Should Pods interior be electrically conductive: Yes**

- G. Conductive 8
- H. Insulating
- I. Semi-conductive
- J. Dissipative 2
- K. Grounded 1
- Other: G, I, J, K

– Why: No electric fields – must protect against ESD

Survey Results

- **What Pod format should be used:**
 - A. 150mm SMIF
 - B. 200mm SMIF 1
 - C. Front Opening Unified Pod
 - D. Stackable
 - E. Gangable
 - F. Single Reticle 2
 - G. Multiple Reticle
 - H. Other: D and F, D E and F, B and F x5, A and F, SMIF but type not determined.
- **If Pods are stackable/gangable/multiple reticle should they be individually accessible (please specify)?**
- **Reticles must be individually accessible**

Survey Results

- **What form of identification should pod's have:**
 - A. Bar Code 1
 - B. Matrix Code 2
 - C. Smart Tag
 - D. Other: A B and C, A and C, A and B, Should be person and machine readable

- **If a Smart Tag should it be writeable?**

Yes x4, should be optional (not standard)

- **Should the Reticle Id/Orientation be readable from Pod (example - a window)?**

Yes x8 – one maybe (not required)

Survey Results

- **Should the Pod provide additional active protection:**
 - A. Electrostatic 1
 - B. Thermophoretic 1
 - C. Gettering (particles, water vapor, organics, etc.) 1
 - D. Other: Should be discussed in workshop, needs more research, all should be explored but cost is a factor
- **How should this be maintained (power/temp source)?**

Electrostatic – ionizing radiation; Battery power x2

- **Are there any suggestions for standard plug location/format, interface areas, batteries?**

Battery power

Survey Results

- **How should external Pod cleanliness be addressed during and after shipping?**

Double Bag, Yes, Laser Particle Counter, Clean Bagging

- **How should external Pod cleanliness be addressed during and after storage?**

Yes, Laser Particle Counter, Reticle and Pod are never in same environment.

- **How should dirty Pods be transported into the clean tool area without cross contamination to ensure cleanliness of the reticles/tool?**

Double Bag, closed transport system, Pod's should be cleanable

- **Will reticles need to be moved from Pods dirtied in shipment to clean pods at the wafer factory?**

Hopefully not but probably yes, Yes, should be designed to stay clean x2,

- **Should the Pod be transparent and have an optical quality window to enable inspection?**

Do not think this is feasible x2, Yes x5, only for ID, No

- **If so, at what wavelengths should the window transmit?**

Visible x2, 550 nm, inspection wavelength or 633nm, Visible and DUV_{INTERNATIONAL}

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Survey Results

- **Reticles:**
- **Is a protective cover needed for the reticle (removable pellicle/particle barrier)?**
 - A. Yes x7
 - B. No x2
 - Have yet to see a solution that doesn't make the problem worse
- **Should the cover stay with the reticle or with the storage/transport pod?**

With Reticle x4, With Pod x1, Pod might be cover

Summary

- **N2 at above atmospheric pressures is preferred to other options**
- **Pod material of choice is plastic. But should be non-outgassing/particulating**
- **Pod's should protect against ESD/Electric Fields by being either conductive or dissipative.**
- **Consensus that reticle Pod's should be single pods and reticles should be individually accessible.**
- **No consensus on Pod ID strategy.**
- **No consensus on how pod's should protect reticles.**
- **Pods should be transmissive to visible light and inspection wavelength if possible.**
- **Agreement that some form of additional protection (removeable cover) and that cover should stay with the reticle.**