

The logo for the Advanced Mask Technology Center features a stylized 'A' composed of blue and grey geometric shapes. The background of the slide is a blurred image of a semiconductor fabrication plant with white wavy lines overlaid.

ADVANCED MASK

TECHNOLOGY CENTER

EUV mask maker's carrier considerations

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FACT 1:

Mask touching cause contamination

Handling frame or intra box concept named for contamination reduction
→ “indirect touching” under investigation for fulfilling related ITRS spec

- Does indirect touching apply for more than loading EUV mask at Scanners?
- Will indirect touching appropriate method for EUV mask handling at all?
- Does indirect touching concept include also mask maker site?

if ***YES?***

Handling frame / intra box concept will impact current carrier form factor



FACT 2:

**Current wafer fab's recticle carrier of choice is RSP150 per SEMI E111
RSP150 is not an adequate EUV mask carrier!**

Because, e.g.:

- Handling frame / intra box change form factor
- New form factor does not fit to SEMI E111/E112 dimensions
- SEMI E19.3 (SMIF) latching does not keep the pod closed

Wafer fabs (mask users) need a new carrier design for EUV masks

This causes *new* carrier handling and storing designs, such as

- Loadports
- Stocker
- Transportation

Wafer fab's EUV mask logistics will be different, anyway

There is just the chance to create a EUV carrier on best practice



FACT 3:

New EUV mask carrier will be a pod (= box)

There is the choice

- Top opening ~-> Hoya box
- Bottom opening ~-> SMIF, RSP
- Front side opening ~-> FOUP

What's best?

Of course not top opening

**Basic concept**

e.g.

SEMI Standard

Latch mechanics

Gasket

Latching sides

Latches

Pull force during opening

Alignment

Transport surface

Tool contamination risk*

Manufacturability

bottom opening

SMIF/ RSP

E19.4 & E100

within door

within door

2

4

gravitation

Registration pins

equal with bottom
opening area

~ low

fair !!

front side opening

FIMS / FOUP

E62 & E47.1

within door

within shell !!

up to 4 !!

up to 8 !!

suction cups !!

Kinematic Coupling !!

independent from
front opening area !!

very low !!

more challenging

**Experiences from using both carrier designs see an advantage in FOUP because of less particle contamination risk*



FACT 4:

EUV exposing works only within high vacuum

Concerning mask transfer from outside into scanner

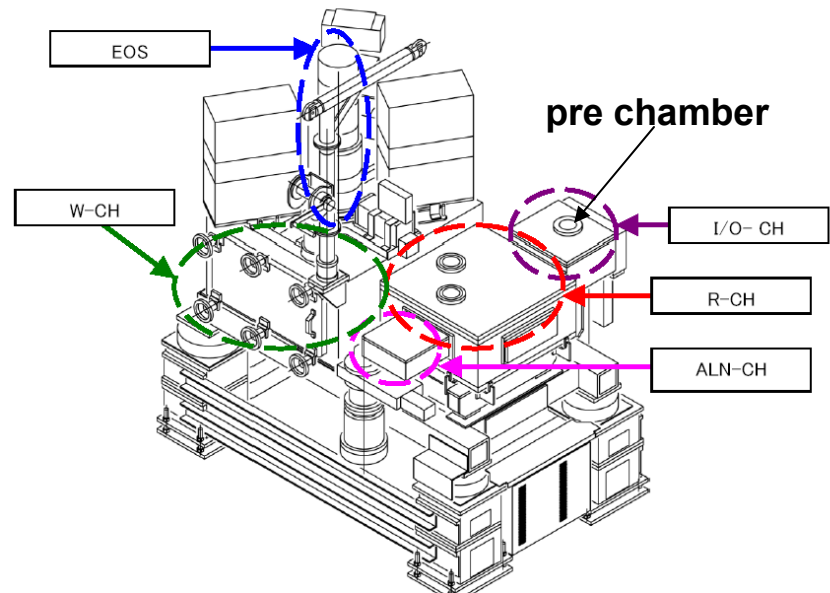
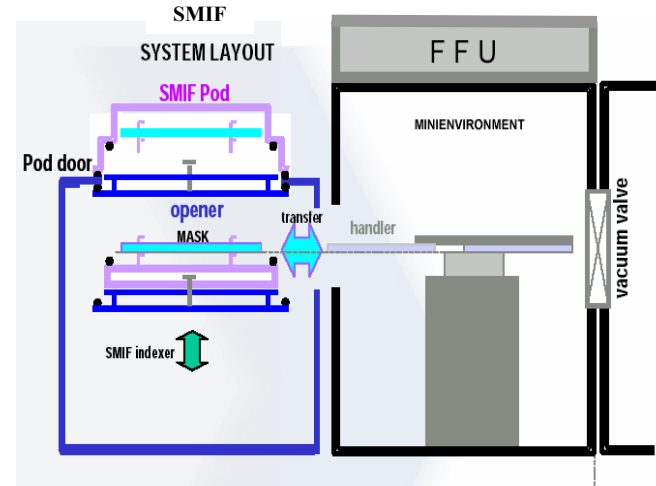
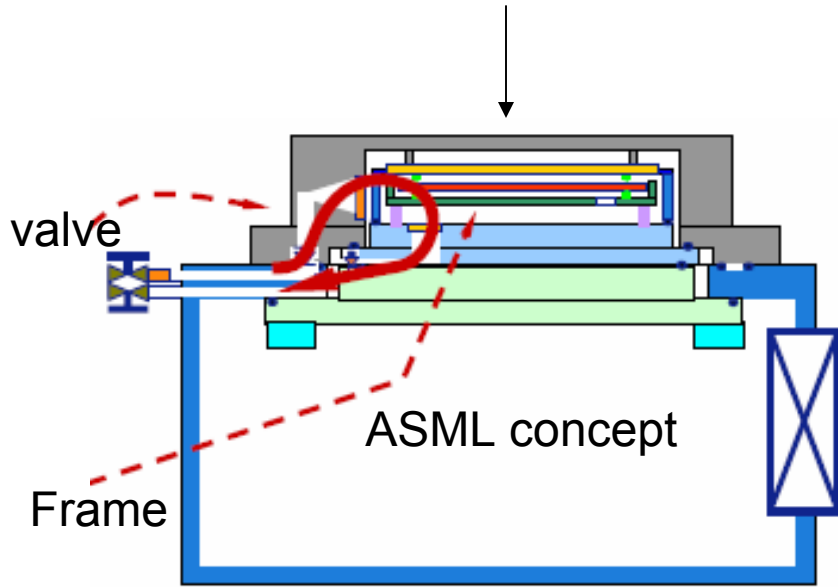
should we use the carrier as part of the vacuum chamber?

or **Carrier simplification vs. footprint & cycle time**

should we pump the vacuum in an independent vacuum pre chamber?



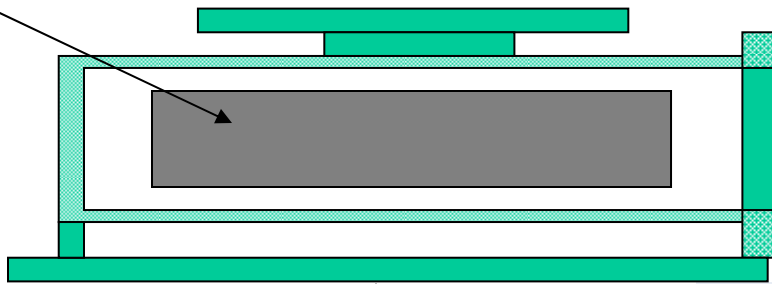
Pod is part of vacuum chamber



SMIF?

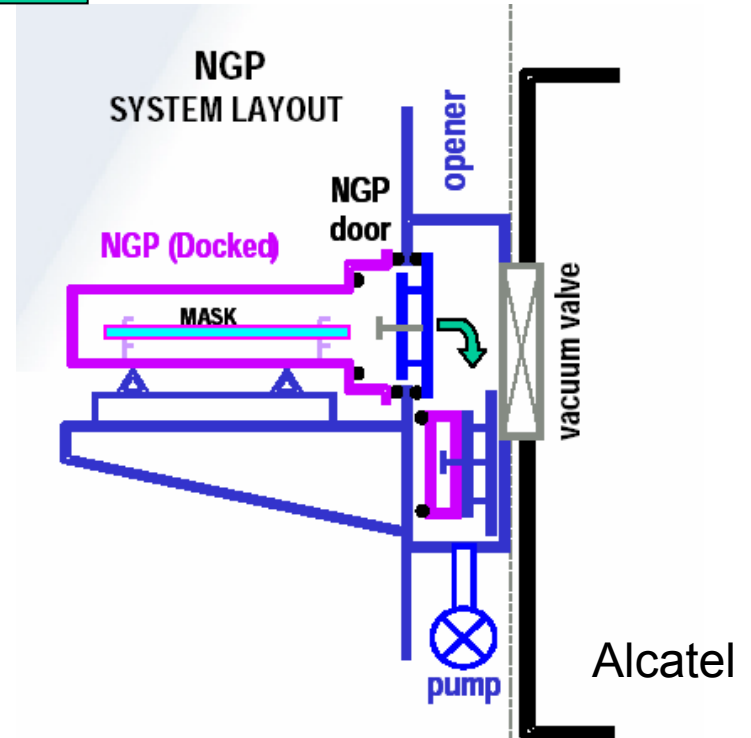


Reticle within intra box or at frame



KC Coupling per E52
But not FOUP dimensions

FIMS E62 principle



R
FOUP?

Front Opening Reticle Pod



FACT 5:

e.g. 5 different carrier requirements



?

- one carriers design for all?
- one design concept tailored for specific applications?
- Applications optimized carrier designs?

&

Corresponding physical interfaces



**Platform
SMIF* or not SMIF,
that is the question**

*SEMI Standard E100: Reticle SMIF Pod RSP200



AMTC considers

- **1 Carrier design for EUV mask making, shipping and using, only**
(for mask house, wafer fab and shipping in between)
- **1 Loadport design only for all**
- **Make the carrier “inexpensive” but clean**
→ **no special vacuum application integrated**

Even AMTC had fully implemented SMIF & RSP200:

- **FORP concept looks more promising for the EUV future**