USE OF EUV PODS at imec

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UNIQUE INFRASTRUCTURE REALIZED

INTEGRATING CLEANING, BACK-SIDE INSPECTION AND AUTOMATED HANDLING OF NXE3100 RETICLES

Süss MaskTrack *Pro* Cleaner

Süss MT *Pro* InSync

Pre Clean

Wet Transfer

Final Clean

172 nm UV Exposure

Facility IN

Backside Particle Inspection

SPARK

EIP Library

Dry Flip

Soft RTP

Transfer Handling

Buffer

Aligner

Buffer

Aligner

Reticle Transfer Handling

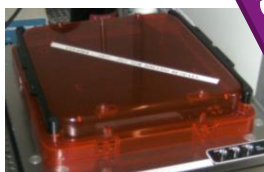
EIP Transfer Handling

Exchange Port

SMIF Load Port

Was for ADT)

Dual Pod Load Port



RSP200

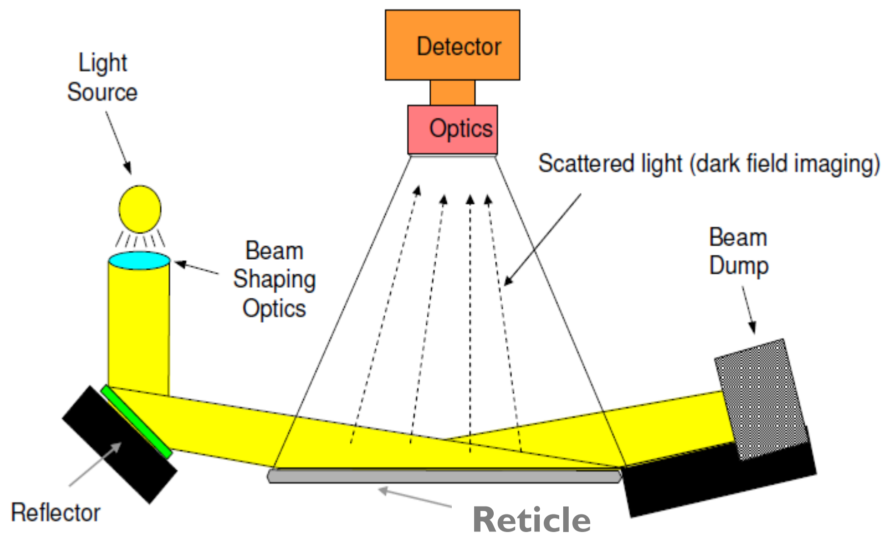
Shippable EUV POD to be established

EUV POD Type A

Mask shop

NXE3100

RETICLE BACK-SIDE INSPECTION



Darkfield full substrate imaging technology

Nanda Tech → nanometrics

SPARK-RIM

Typical Performance

Particle detection size	150nm (via PSL)
Routine use (back-side)	>95% capture rate >250nm
Defect size repeatability	>90%
Measurement time	< 5min
Defect detection on front-side	Empty areas, needs dedicated calibration

Assignment of a size to a detection is based on the intensity of the scattered light! DISCLAIMER: Calibration done for PSL. Mind that the sizing accuracy for an arbitrary "defect" with a given shape and morphology may be limited.

OUR TARGET SCENARIO FOR MASK HANDLING

New NXE3100 reticles

- Receive the reticle in EUV pod.
- Inspect reticle back-side on SPARK.
- Evaluate inspection results against practical target "OK for NXE3100"
  - If OK: Reticle in Type A EUV Pod can be moved to Scanner
  - If not OK: Clean reticle to reach OK status (+ follow-up if not possible)
- Reticle mates with fixed EUV pod.

Routine check of NXE3100 reticles in use (particle monitoring)

- Same way, automated, via its EUV pod Type A in use on the NXE3100

All via fully automated handling within MT *Pro* + InSync

OUR PRESENT SCENARIO FOR MASK HANDLING

New NXE3100 reticles

- The reticle is received from the mask shop in …
  - … shipping box: manual load into RSP200, auto transfer into EUV pod on InSync
  - … RSP200: auto transfer into EUV pod on InSync
  - … EUV pod: so far it was not yet fully considered shippable
- Reticle back-side is inspected on SPARK.
- Evaluate inspection results against practical target "OK for NXE3100"

  → Still operator decision (inspired by # detections)
- Reticle mates with fixed EUV pod.

Routine check of NXE3100 reticles in use (particle monitoring)

- Same way, automated, via its EUV pod Type A in use on the NXE3100

All via fully automated handling within MT *Pro* + InSync

EUV POD RELATED...

EUV pod **status**

- So far only **Entregris pods Type** A in use at imec.
- Imec ordered **modified Type B of Entegris** (InSync requiring “pockets”).
- The latter is now less relevant because of shipping data for Type A ?
- **Gudeng pods**: More recently qualified for NXE3100 by ASML. Modification to InSync EIP gripper scheduled. Hence not used at imec so far.

EUV pod **cleanliness testing** (Entegris Type A)

- 1st test via 20x open/close cycling on Insync:
  no adder for new pod, nor for one **after ~10 months of use**

Shipping results in EUV pods (Entegris Type A)

- 2 plates, prequalified on SPARK, sent back and forth to US, one site each
  - **Front-side** : both plates have zero adders >250nm
  - **Back-side** : 1st plate has 2 adders >1μm, 2nd plate has 6 such adders

Need to establish shipping by/from mask shop in EUV pod !!
(= removable hard pellicle, assuring FS cleanliness)

CONCLUSIONS

- **Infrastructure** in place for **integrated cleaning**, **automated handling** and **back-side inspection** of NXE reticles (interfaced to scanner via EUV pods).
- **Particle adders by on-site handling are minimized.**
- Very valuable for **learning** about particle contamination of NXE reticles, and **avoiding** it.
- *Not shown here, but see my presentation in session 3 at EUVL Symposium*
  - Back-side monitoring helps a lot to trace overlay critical particles, but still **misses capability to differentiate** between those and other (large) detections.
  - Infrastructure and procedures in place ...
    allow to reveal particle adders by other sources
- Our intention and suggestion is ...
  To start using **EUV pods for shipping** from the mask shop.

Details: see session 3 at EUVL Symposium