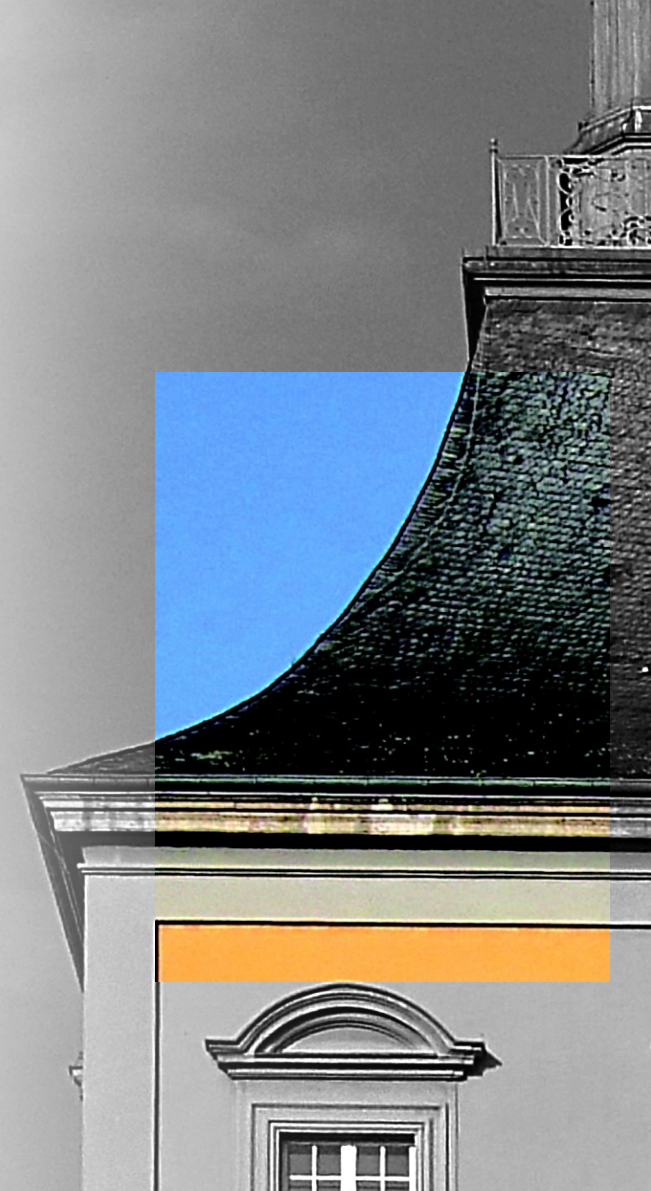


Upgrade of exposure machines: Mask aligner

Cleanroom Meeting 05.10.2026

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Motivation

- Currently only option to expose photoresist:
 - Heidelberg Instruments MLA 150
 - [LED Exposure Unit (Not viable if resolution and alignment requirements are high)]
- MLA is very slow (3-4h per wafer)
 - Process with 3 photo resist (PR) layers → 9 – 12h for exposure alone!
 - Photoresists need to be processed within specific time frame:
 - Long exposure times lead to problems, when doing multiple layers
 - PR sits in uncontrolled (high humidity/high temperature) for very long time
- MLA not designed for 200mm wafers
 - Issues with metalized wafers (sensor triggers)
 - Issues with processed wafers due to insufficient vacuum chuck

Mask aligners

Proposal to overcome issues: Buy Mask Aligner

- Options for 200mm (300mm) wafer support → native, no issues like with MLA
- Exposure time (loading/alignment included) 2-5min
- Masks could be created with MLA in house (low cost and fast) up to 9" (for 200mm wafers)
- Solves all before mentioned problems
- Would enable us to do small scale productions (e.g. for Belle II/GridPix/Insight/GEMs)
- Marketanalysis lead to 4 companies

3 options for Semi-automatic Mask Aligners

- Semi automatic Mask Aligners from
 - EVG
 - SUSS
 - SPS
- Starting between 300k€ and 420k€ for 200mm machine
- ~1µm precision
- Lithography masks only, no shadow masks, no flexible masks
- Meetings with all 3 companies suggest:
 - Very not flexible machines
 - Very expensive
 - Somewhat user friendly



One Manual Mask Aligner (MMA) Idonus

- Fully manual (very operator dependent)
- ~1um precision (if 1um upgrade ordered)
- Shadow mask/flexible mask/lithography mask all in one machine
 - Small scale productions on SI wafer base
 - Backup for GEMs
- ~200k€ for fully specced out 200mm machine
- ~300k€ for fully specced out 300mm machine (square exposure)
- Promising visit to company

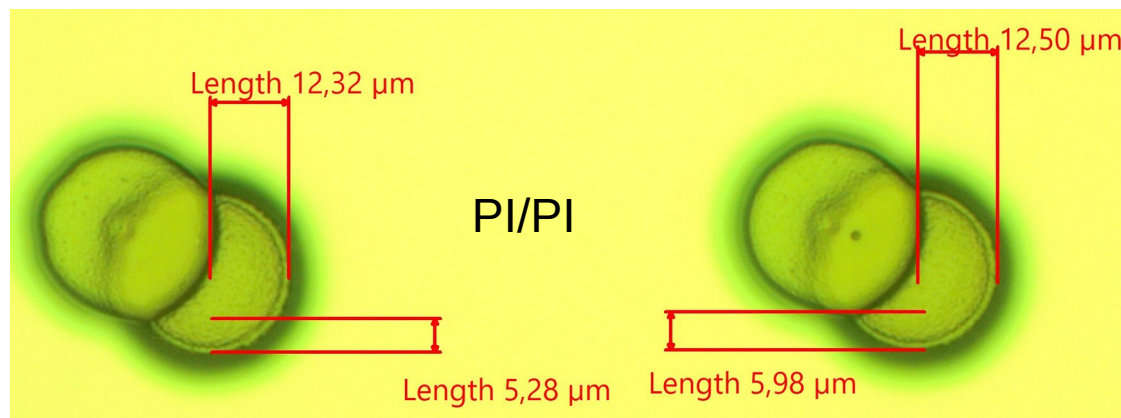
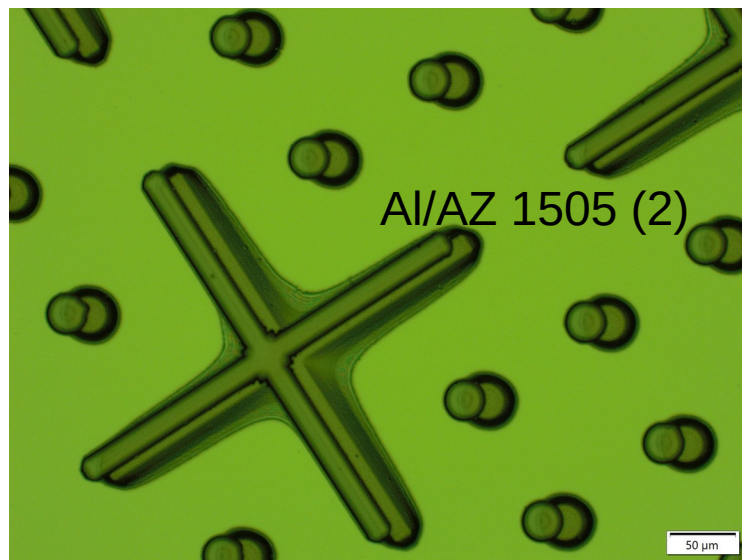


Idonus on site

- We visited company in Switzerland to get impression of machine
- Tested alignment and handling of machine
- Machine was testsystem, not production system!
- Alignment structures on mask blocked view on structures on substrate
- Machine was not aligned properly and only proximity exposure was possible (no vacuum, no contact)
- Wedge compensation was (very obviously) not done properly (at all)!
- No 1 μm precision upgrade
- Still positive impression of machine

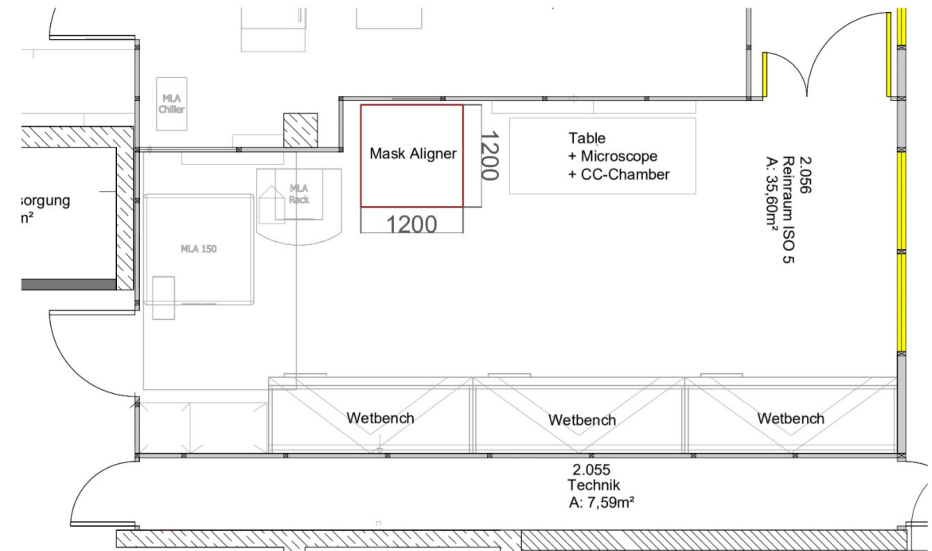
First alignment and exposure tests

- Missaligned by ~15μm in x
- Missaligned by ~5μm in y
- Systematic offset (calibration possible!)
- High quality exposure, sharp edges and good uniformity



Placement in ISO 5

- Proposal Placement: Place where current LED exposure unit is positioned
 - LED exposure unit not usable for alignment work
 - Relocation to ISO 7 during installation of yellow light area in back of ISO 7
- For the beginning rearrange tables in ISO 5
 - Keep LED EU in wall
 - Place MMA beside microscope
 - Rearrange table in front of window (?)
- Details to be discussed but space availability is certain



Conclusion

- Idonus machine is best option for our Cleanroom
 - Most flexible
 - Most affordable
 - Self serviceable
 - All needed infrastructure already available
 - Space in Cleanroom is available
- Extends possibilities of processing/manufacturing in FTD dramatically
- On very short notice, option arose to buy machine from CmF money – application was prepared but not submitted...

...unfortunately...