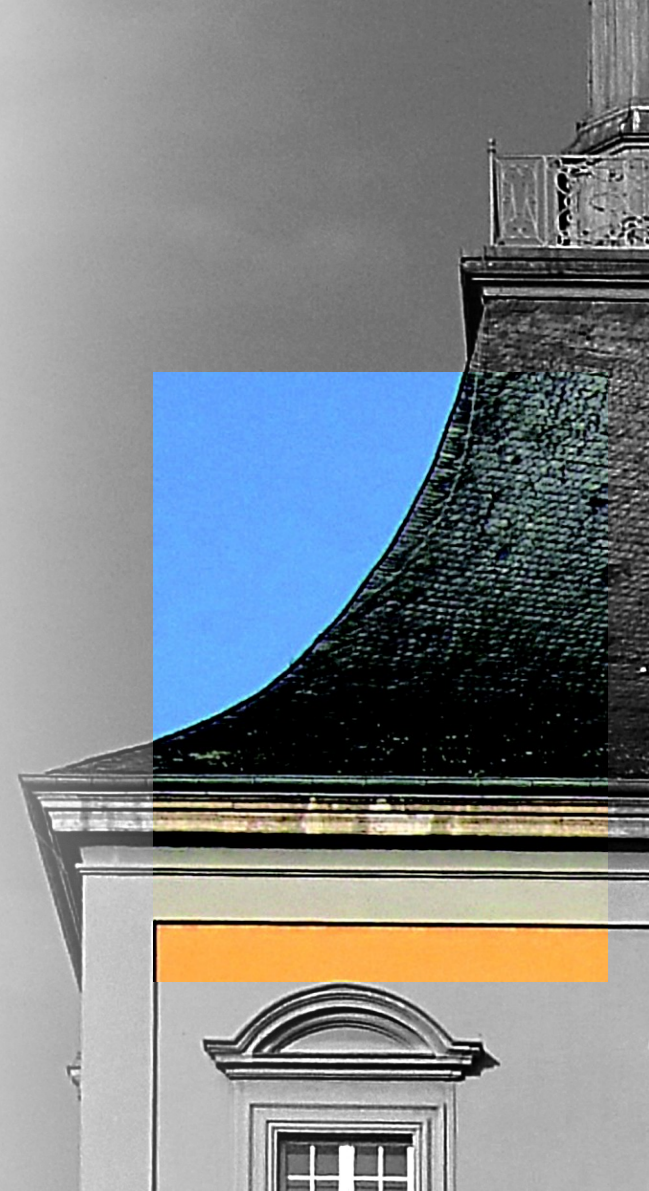


Upgrade of exposure machines: Mask aligner

Cleanroom Meeting 27.07.2026

Andreas Ulm

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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 good for R&D → many design changes in short time
- MLA is slow (3-4h per 200 mm wafer with HD 4100(thick resist))
 - 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 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)

- Solves all before mentioned problems
- Would enable us to do small scale productions (e.g. for Belle II)
- Depending on machine:
 - enables use of shadow masks
 - Flexible masks could be used
 - Purely mechanical machine → service easy and we can to a lot by ourselves

Option 1: EVG

- Semi automatic
- ca. 300k€
- ~1 μ m precision
- Only one type of mask possible (glas masks)



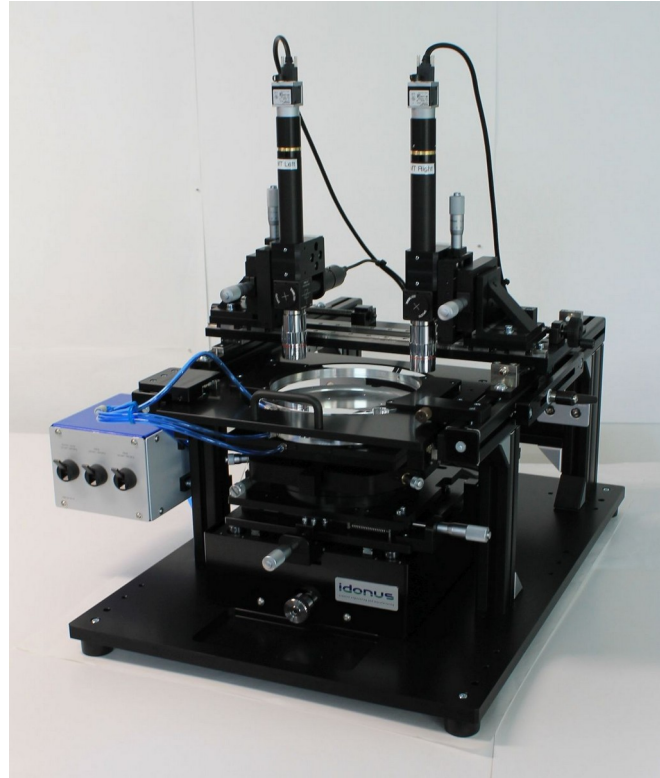
Option 2: SPS

- Semi automatic
- ca. 300k€
- ~1 μ m precision
- Only one type of mask possible (glas masks)

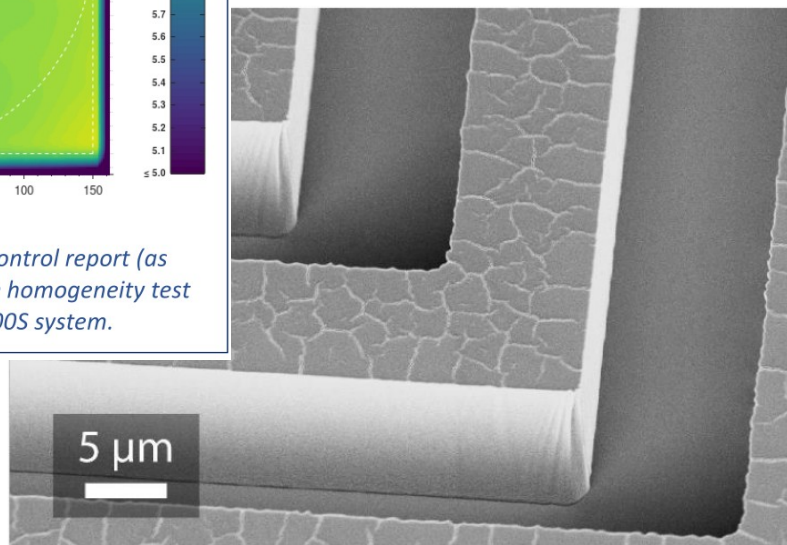
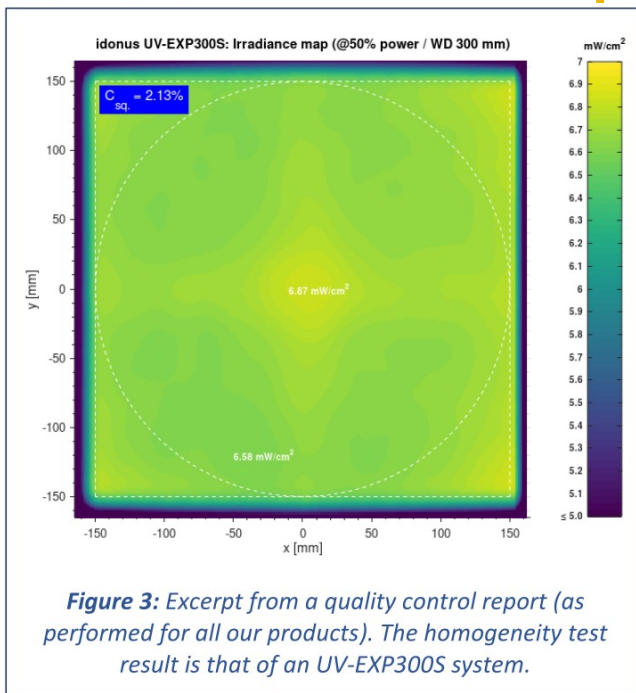


Option 3: Idonus (favorite)

- Fully manual
- ~1um precision
- Exposure unit included
- Shadow mask/
flexible mask/
glas mask
etc.
→ all in one machine



Option 3: Idonus (Expoure unit)



UV-EXP line



Model	UV-EXP150R-SYS	UV-EXP150S-SYS	UV-EXP200S-SYS or UV-EXP200R-SYS	UV-EXP300S-SYS
Exposure area	Ø 150 mm	150 × 150 mm ²	200 × 200 mm ² or Ø 200 mm	300 × 300 mm ²
Wavelength	365 nm and/or 385 nm / 395 nm / 405 nm / 435 nm (one wavelength standard) all models can be configured with UV-LEDs with multiple wavelength peaks (e.g., 1LE-3WL: Light Engine with 365/405/435 nm combination)			
Irradiance @ 365 nm	40 mW/cm ²	40 mW/cm ²	25 mW/cm ²	12 mW/cm ²
Irradiance @ 385, 395 and 405 nm	50 mW/cm ²	50 mW/cm ²	30 mW/cm ²	17 mW/cm ²
Irradiance non-uniformity ^a	±3%	±3%	±3%	±3%
Collimation angle ^b (+/- α, FWHM °)	±1.8°	±1.8°	±1.4°	±0.9°
Working distance (WD)	350 mm	300 mm	400 mm	300 mm
Options and variants	☐ Adjustable Collimation Angle – UV-ACA: manually exchanged apertures to decrease the collimation angle at the detriment of the irradiance. The module is installed on the light engine and the UV-EXP comes with an access opening for manual exchange of apertures ☐ Water cooling – UV-WA: for continuous use with highly stable output. ☐ Light engine upgrade to 2x or 3x LEDs with different wavelengths – (2LE or 3LE): for increased versatility of use (a mechanical switch accessible from outside the UV-EXP allows the user to select the LED to use) ☐ Sample holders: Substrate and mask holder (chucks) for soft contact or vacuum contact: ☐ Ø 2" ☐ Ø 3" ☐ Ø 100 mm ☐ Ø 150 mm ☐ Ø 200 mm ☐ Ø 300 mm			

Option 3: Idonus (Offer)

Quotation 20260072

Your Reference conf call 30.04.2026, Yergen Bilevych (Rev1)
Quotation Date: 20.06.2026
Expiration 31.12.2026
Incoterm EXW
Contact person Christian Spoerl

Pos	Description	Quantity	Unit Price	Taxes	Amount
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Manual UV-LED Mask Aligner and Shadow Mask Aligner

10	[P1801-08] MAS200 Modular alignment system for shadow mask or other mask to substrate alignment * size: up to 200mm * standard model for alignment precision of typically 2 - 3 um (others on request) * base unit with 3 linear axis and 1 rotation axis and 2 tilt axis for tilt (wedge) error compensation	1.00 Unit(s) (1 2026-0902)	37'300.00	0%	37'300.00 CHF
20	[P1801-14-05] MAS-CSMW200 Chuck for shadow mask to wafer clamping size: 200mm	1.00 Unit(s)	3'500.00	0%	3'500.00 CHF
30	[P1801-14-04] MAS-CSMW150 Chuck for shadow mask to wafer clamping size: 150mm	1.00 Unit(s)	3'220.00	0%	3'220.00 CHF
40	[P1801-14-03] MAS-CSMW100 Chuck for shadow mask to wafer clamping size: 100mm	1.00 Unit(s)	2'900.00	0%	2'900.00 CHF

150	[P1801-24-51-08] PLX-BWC100 wafer chuck 100mm diameter
160	[P1801-24-51-08] PLX-BWC100 wafer chuck 150mm diameter
170	[P1801-24-51-08] PLX-BWC100 wafer chuck 200mm diameter

OPTIONAL:

180	[P1801-24-41-01] PLX-WEC150 Wedge error compensation module required for 1um alignment tolerances
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UV-LED light source

190	[P0904-24-00] UV-EXP200S UV LED exposure system Performances: - Wavelength: 365 nm (others on request) - Exposure area: square 200x200 mm - Collimation angle: < +/- 1.5° - Non-uniformity: Michelson contrast, C = (max-min)/(max+min) < 3% - Irradiance (optical power density): 30 mW/cm2 (adjustable 10% to 100%) - Working Distance: 400 mm - Cooling type: heat pipe (= air fan) - Size: ~40x40x75 cm
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200	[P0904-00-003-01] UV-LED-WL-MIX3 Mixed wavelength LED with 365+405+435nm individual controllable
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Details:

- Wavelength: mixed 365+405+435nm
- Irradiance (optical power density): typically 33 mW/cm² (adjustable 10% to 100%)
- Wavelength ratio:
365nm -> max 44%
405nm -> max 30%
435nm -> max 16%

50	[P1801-12] DIM-DM Double Image Microscope for MAS consists: * Microscope tube lens (2 units) * 5x Objective lens (2 units) * Cameras (2 units) with image acquisition software * LED VIS reflection illuminations (2 units) * XYZ stage (2 units) * Linear slider for DIM unit in/out * Base and frame	1.00 Unit(s)	27'050.00	0%	27'050.00 CHF
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Note: PC (not included) for camera image acquisition required

60	[P1801-23-03] OBJ-10x - Microscope objective lens 10x Long working distance; infinity corrected; WD 36.9mm; NA 0.25	2.0			
70	[P1801-24-42-01] PLX-HP150 High precision upgrade for alignment precision of +/- 1um	1.0			
80	[P1801-24-00-00] PLX-GENERAL Measurement gauges XYZ axis	4.0			
90	[P1801-00-502-00] PLX-MGB200 Machine Granite Base with Frame	1.0			

100	[P1801-00-101-00] PLX-PCU Pneumatic Control Unit	1.0			
110	[P1801-24-60-01] PLX-PC PC, computer for image visualization	1.0			

120	[P1801-24-52-05] PLX-TMC Mask chuck, size 5" square	1.0			
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130	[P1801-24-52-05] PLX-TMC Mask chuck, size 7" square	1.0			
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140	[P1801-24-52-05] PLX-TMC Mask chuck, size 9" square	1.00 Unit(s)	1'460.00	0%	1'460.00 CHF
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210	[P0904-174-00] UV-EXP-CU-G3 UV-EXP Control Unit (Gen. 3) with 10-inch touch screen (standalone version). System suitable for the control of single and multi-wavelength UV-EXP exposure systems.	1.00 Unit(s)	2'790.00	0%	2'790.00 CHF
220	[P0904-00-030-01] UV-SENS-GaP UV Sensor (GaP) for irradiance measurement and feedback control	1.00 Unit(s)	910.00	0%	910.00 CHF
230	[P0904-24-01] UV-MB200S light source base frame	1.00 Unit(s)	3'800.00	0%	3'800.00 CHF
240	[P0904-24-02] UV-SHIELD200S UV safety shield with vertical sliding door	1.00 Unit(s)	1'900.00	0%	1'900.00 CHF
250	[P0904-00-50-01] UV-ACA Adaptable collimation angle Set of 3 aperture; manual exchange	1.00 Unit(s)	750.00	0%	750.00 CHF

Facility requirements:
Vacuum
N2 or CDA
110-230V AC el. power plug

Subtotal	56'700.00 CHF
Untaxed Amount	198'490.00 CHF
VAT 0%	0.00 CHF
Total	198'490.00 CHF

~215k€