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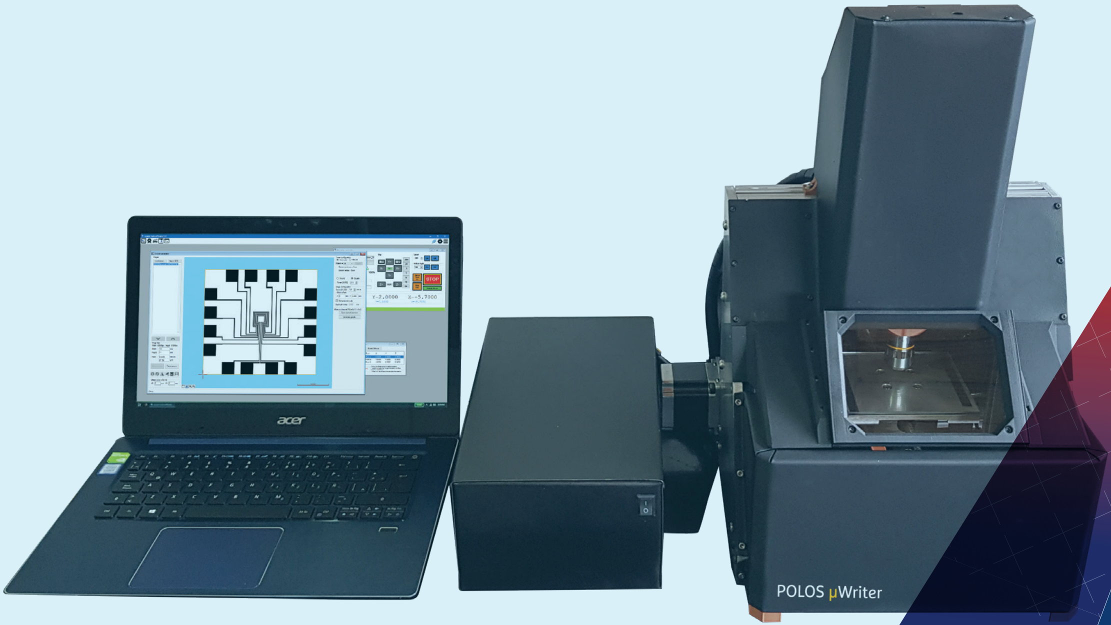
Innovative Products for Semiconductor Processes



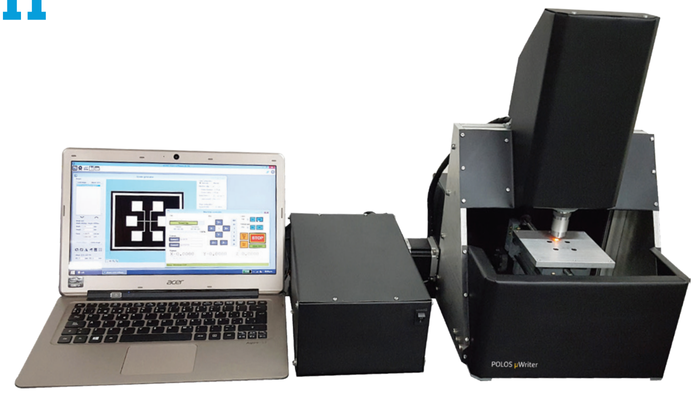
V1-122019

POLOS μWriter

POLOS µWriter

Lithography System

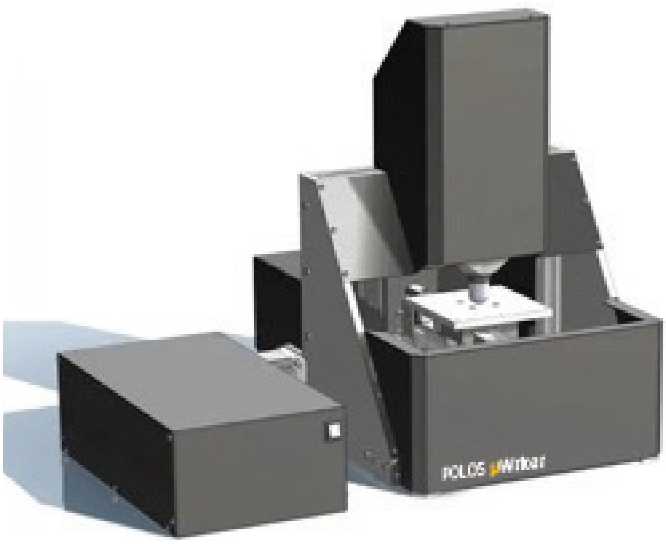
POLOS µWriter is a low cost direct optical lithography system oriented to universities and research facilities looking to expand their capabilities.



Technical specifications POLOS µWriter	
XY Stage	
Typical writing speed	10-12 cm/s
Maximum area	100 x 92 mm
Mech. short range noise onslow and on fast axis	< 1 µm

Realistic minimum feature size: 6-15µm depending on the feature (see pictures next for examples)

Technical specifications POLOS µWriter	
Software	
Supported formats	PNG,GDSII
In-software transformations	Rotation, Reflection, Inversion, Rescaling, Add border



- Multiple designs from different files can be written in one process
- Tilted/warped substrate compensation via 3-point focus or 4-point bilinear measurement
- Mesh type calibration for full-bed curvature compensation

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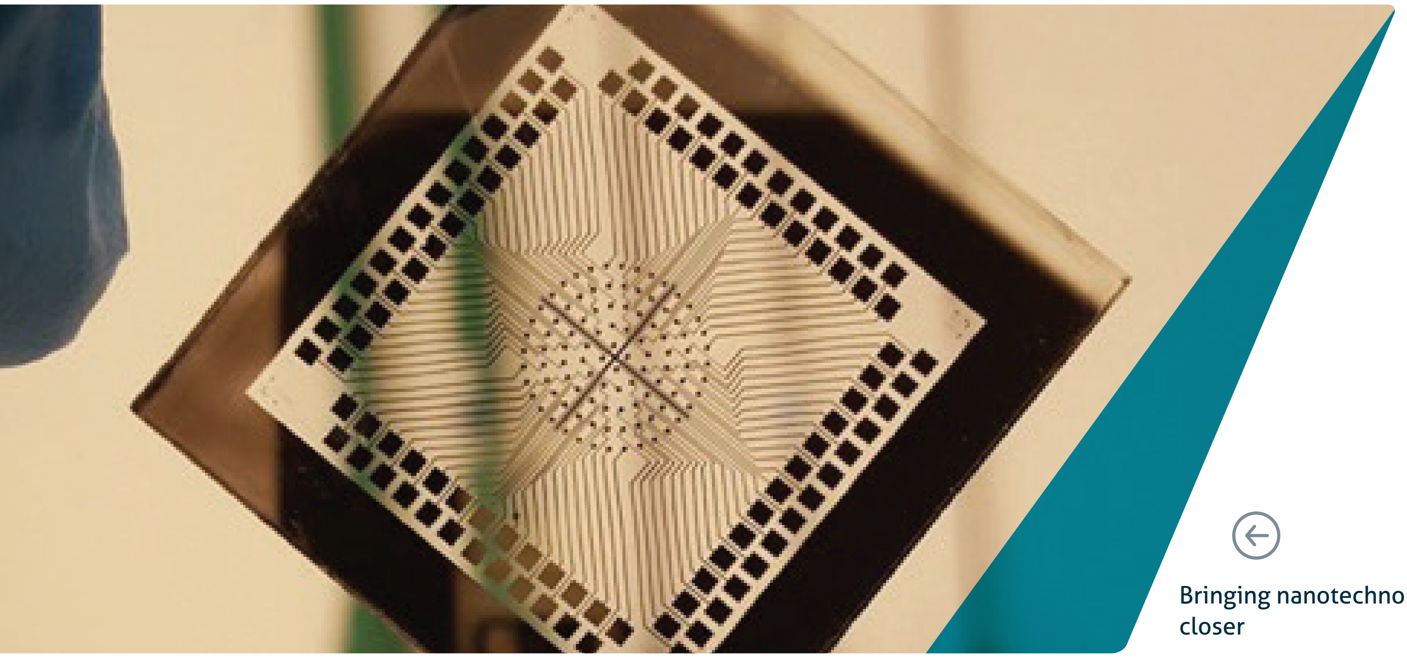


Bringing nanotechnology closer

Optics POLOS µWriter

Recommended raster step of included objectives:

Fine(40x NA0.65):	0.8 µm
Medium(10x NA0.25):	2 µm
Coarse(4x NA0.1):	5 µm

- Confocal microscope for laser focusing, aligning and inspection
- Secondary independent yellow illumination

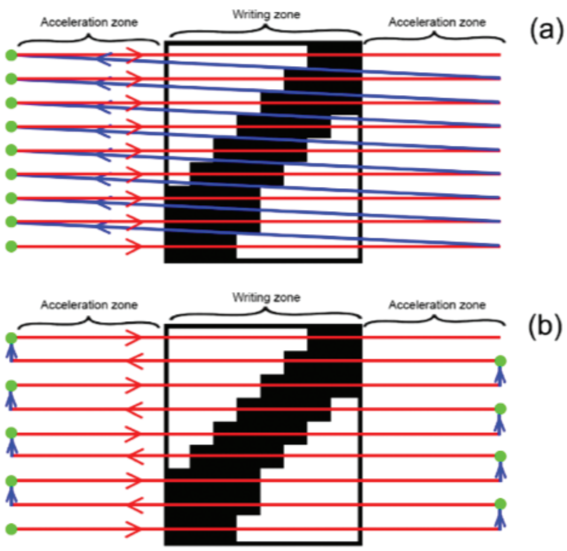
Effective writing speed of included objectives on big areas (unidirectional writing):

Fine:	1.7 mm^2/min
Medium:	4.25 mm^2/min
Coarse:	10.6 mm^2/min

Bigger Numerical Aperture of the objective means:

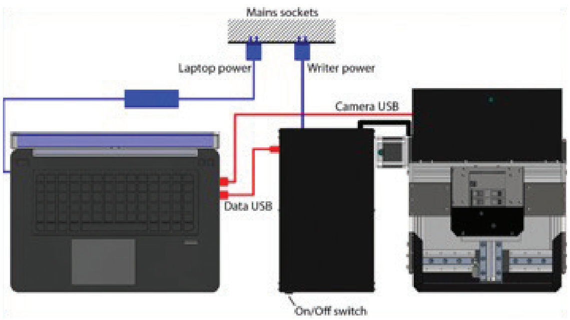
- Smaller spot
- Smaller depth of field
- Higher resolution
- Walls end up less vertical
- Flatness of the substrate is more critical.

The best resolution is obtained with a thin photoresist with high contrast like AZ1512HS. We also use microposit S1800

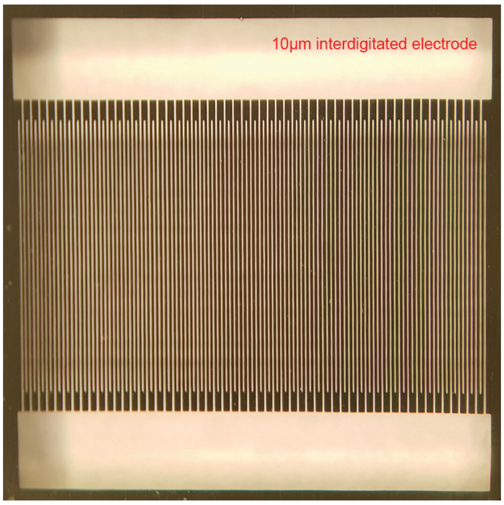


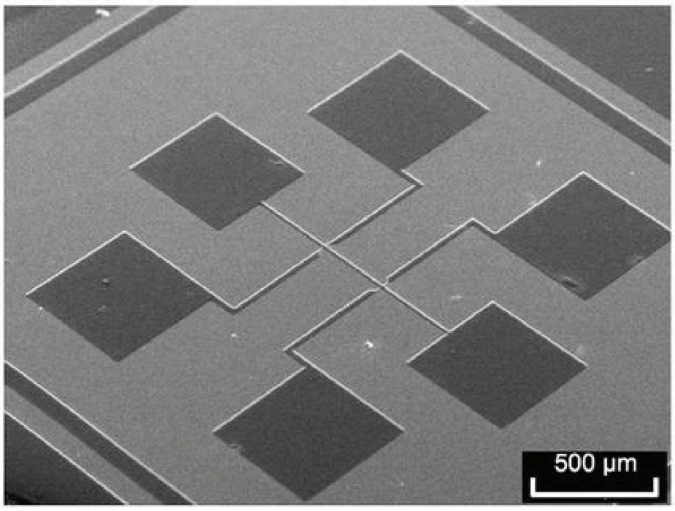
Raster writing modes, unidirectional and bidirectional.
Unidirectional is more precise, bidirectional takes about half the time

Wiring of the microlaser to the control laptop

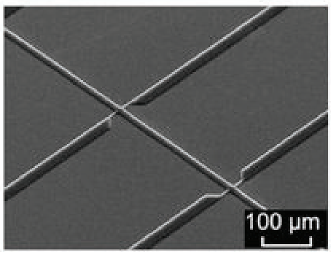


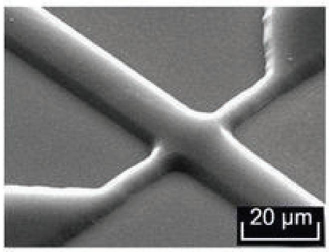
Examples





Current and voltage contacts with longitudinal and parallel configuration (left) and 10 mm interdigitated capacitor (right)





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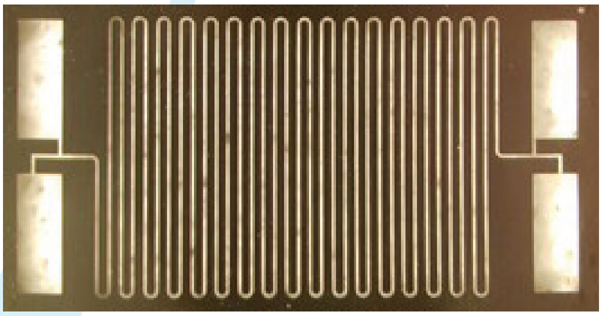
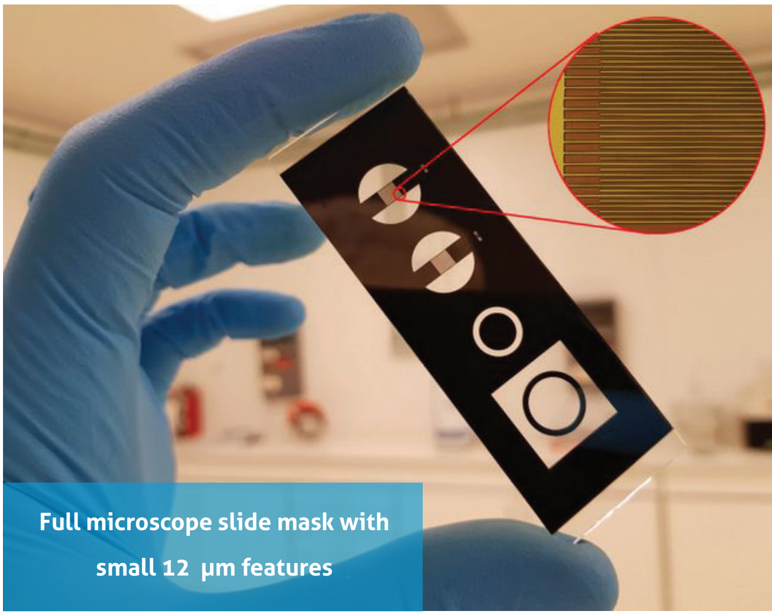


Mask for a platinum resistor for temperature measurement (40 μm track)

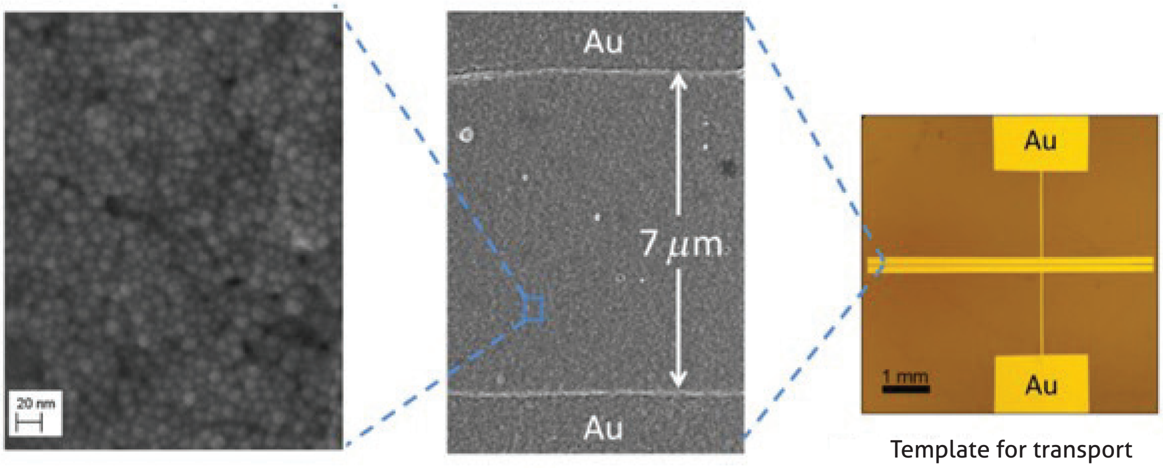


Full microscope slide mask with small 12 μm features

PHYSICAL REVIEW APPLIED 11, 054089 (2019)

Tunnel Magnetoresistance in Self-Assemblies of Exchange-Coupled Cor/Shell Nanoparticles

Fernando Fabris, [1] Enio Lima Jr., [1] Cynthia Quinteros, [1] **Lucas Neñer, [1]** Mara Granada, [1] **Martin Sirena, [1]**
Roberto D. Zysler, [1] Horacio E. Troiani, [1] Victor Leboran, [2] Francisco Rivadulla, [2] and Elin L. Winkler, [1]



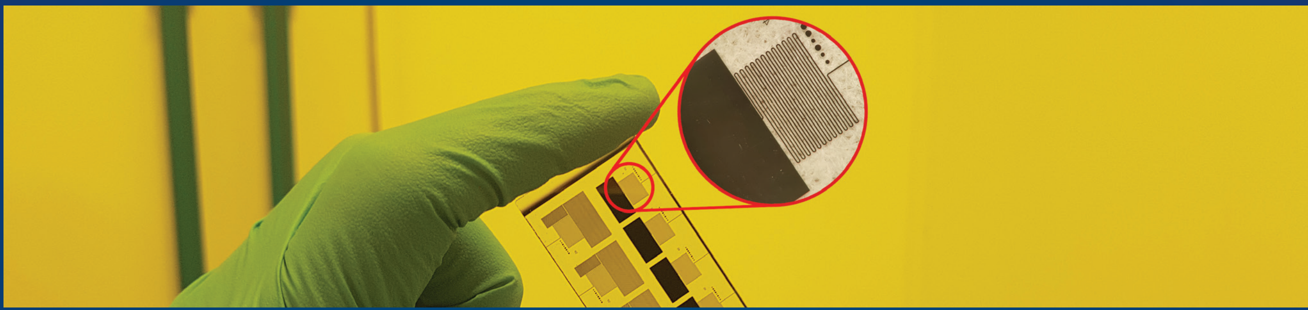
Self assembled nanoparticles film.

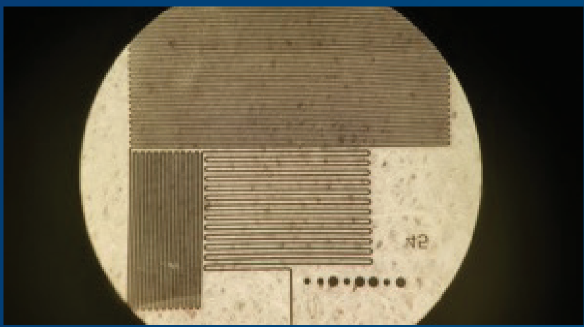
Gold electrodes

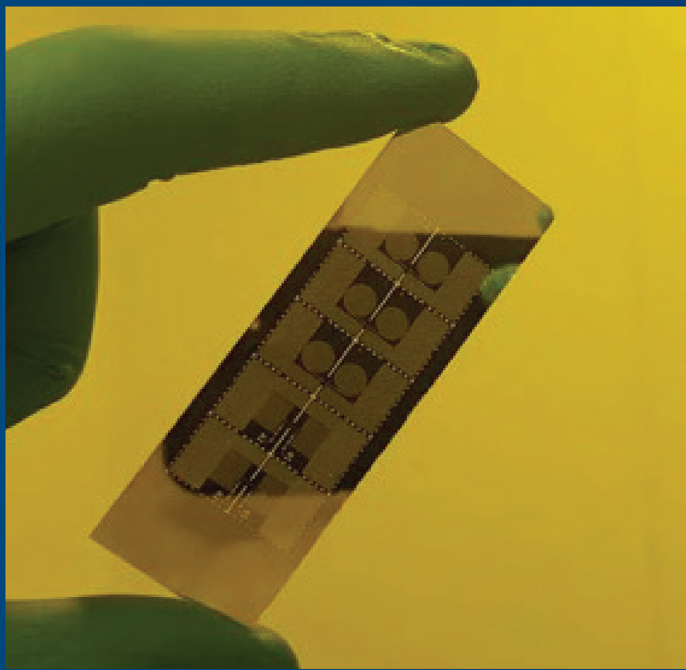
Template for transport measurements.

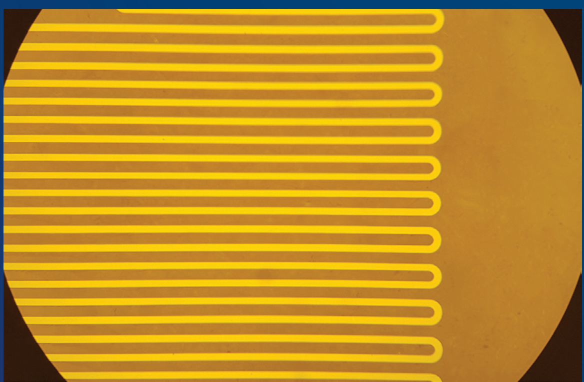
Transport template: Self assembled nanoparticles film.
Gold electrodes 7 mm separation over several millimeters

Microfluidic applications









Curved and very long 10 µm microchannels

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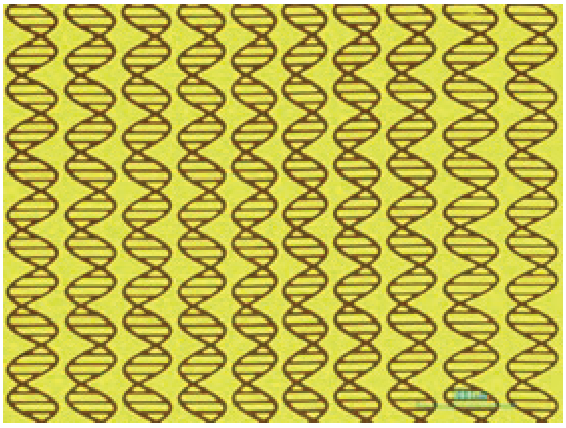
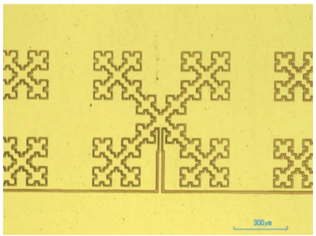
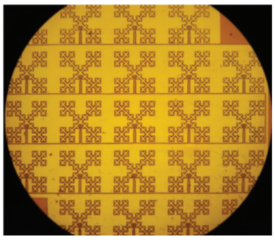
Others:



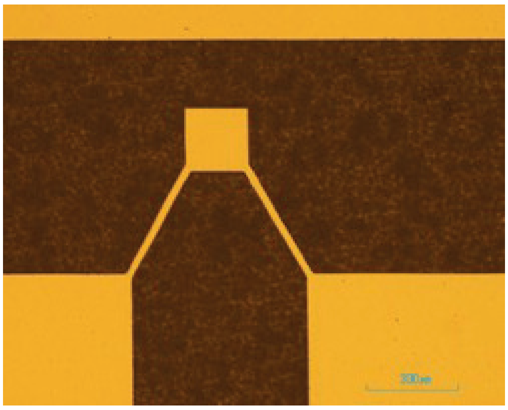
ADN diffraction grating





Fractal micro antennas

Positive and negative writing

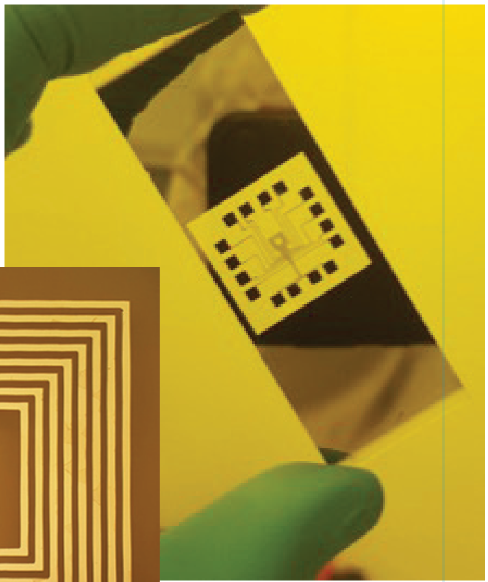


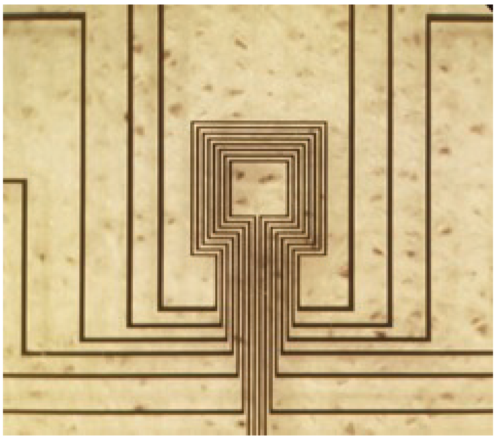
MEMS oscillator photomask

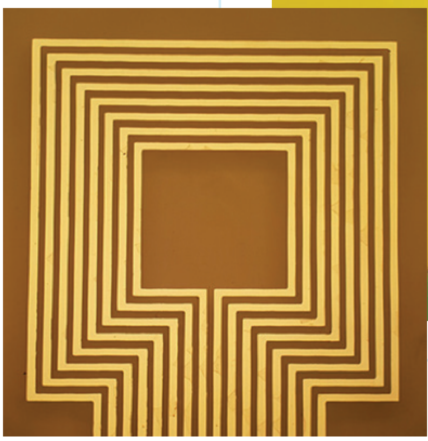
Low resolution (fast) mode

This is using the 4x objective with 5 µm raster step

- The tracks of the example are 50 µm
- This writing took about 80min in unidirectional mode



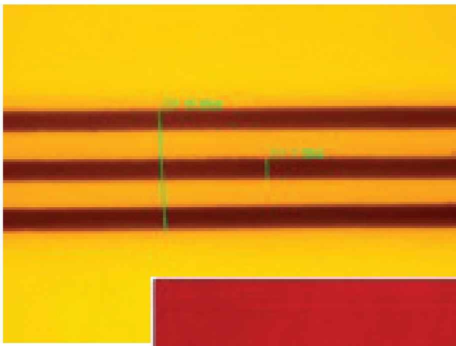




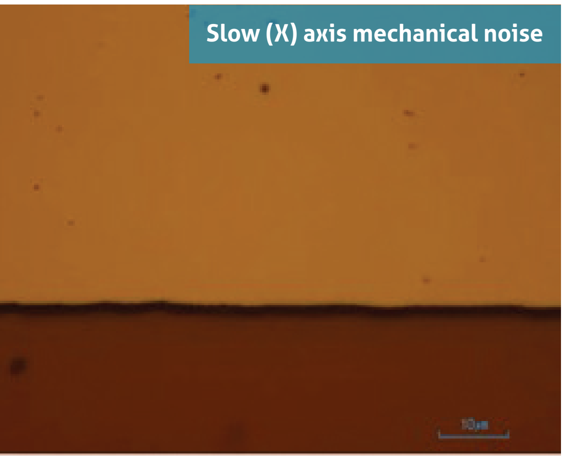
Tests

All the previous examples and the following tests are performed using standard everyday conditions.

- Thermally controlled room.
- Pneumatic table (for isolation of external vibrations)
- Flat substrates (glass, silicon wafers)
- Using the recommended parameters, standard exposition and developing times

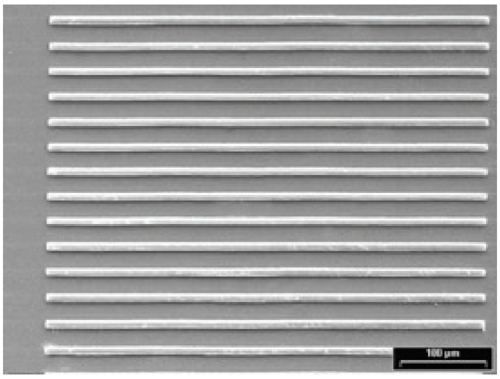


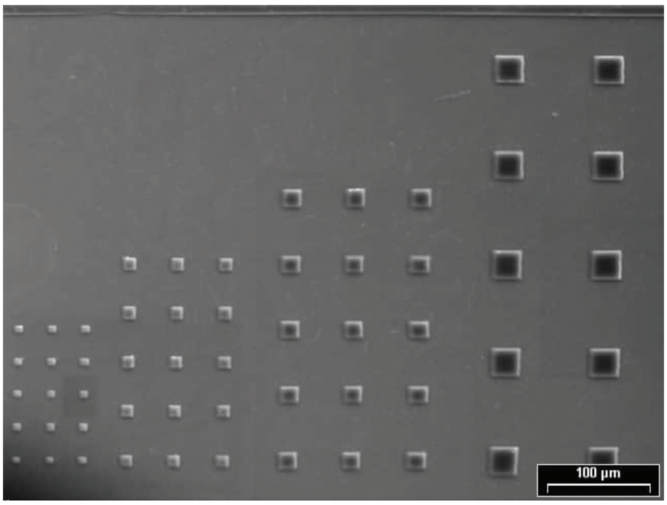
Fast (Y) axis mechanical noise



Slow (X) axis mechanical noise

- Recommended minimum feature size: 10 mm
- writing time of a 25x75 mm design at 0.8 µm unidirectional mode: 20hrs





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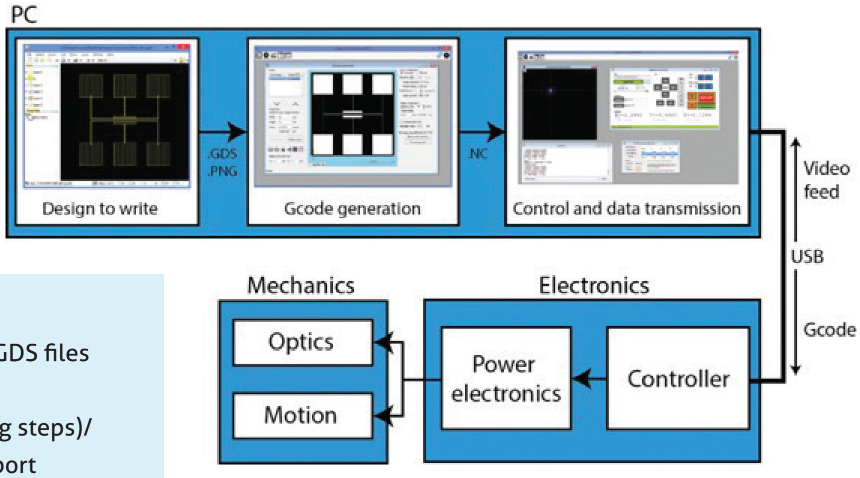
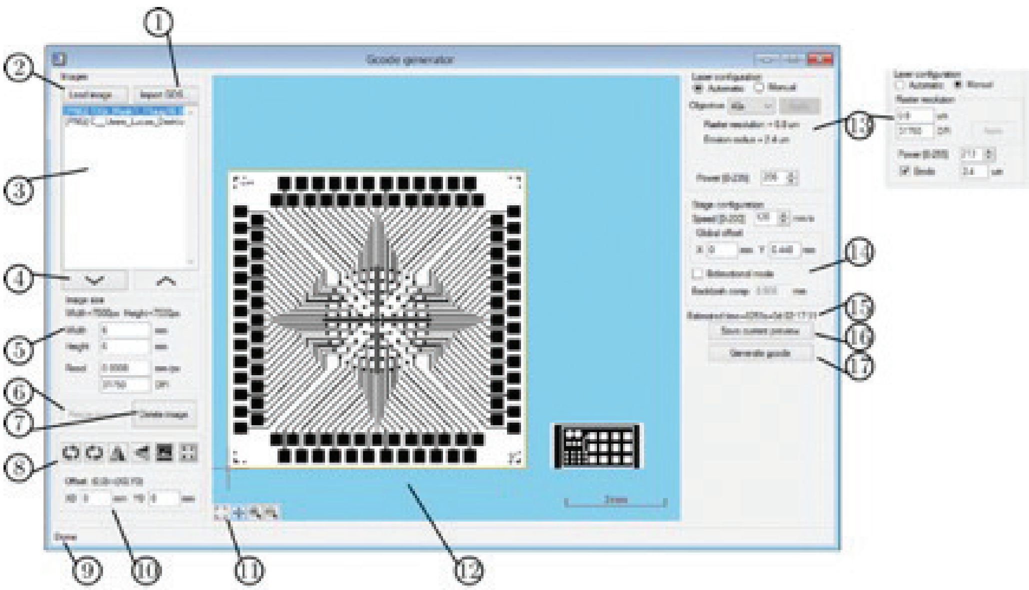
Software

Surface preparation → Holding the substrate → Generating the Gcode file → Leveling the substrate → Running the Gcode file → Surface postprocess



Gcode generation

- Imports one or more cells from GDS files
- Imports PNG files
- Full rescaling and rotation(90deg steps)/ mirroring/inversion/border support
- Multiple imported designs on one project
- Recommended step configuration for provided objectives already on the software
- The user can change almost all the configurations manually for experimentation
- Full GPU based algorithm to achieve accurate clear field and dark field feature

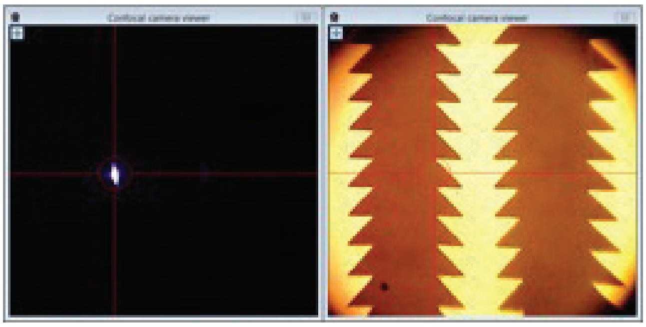


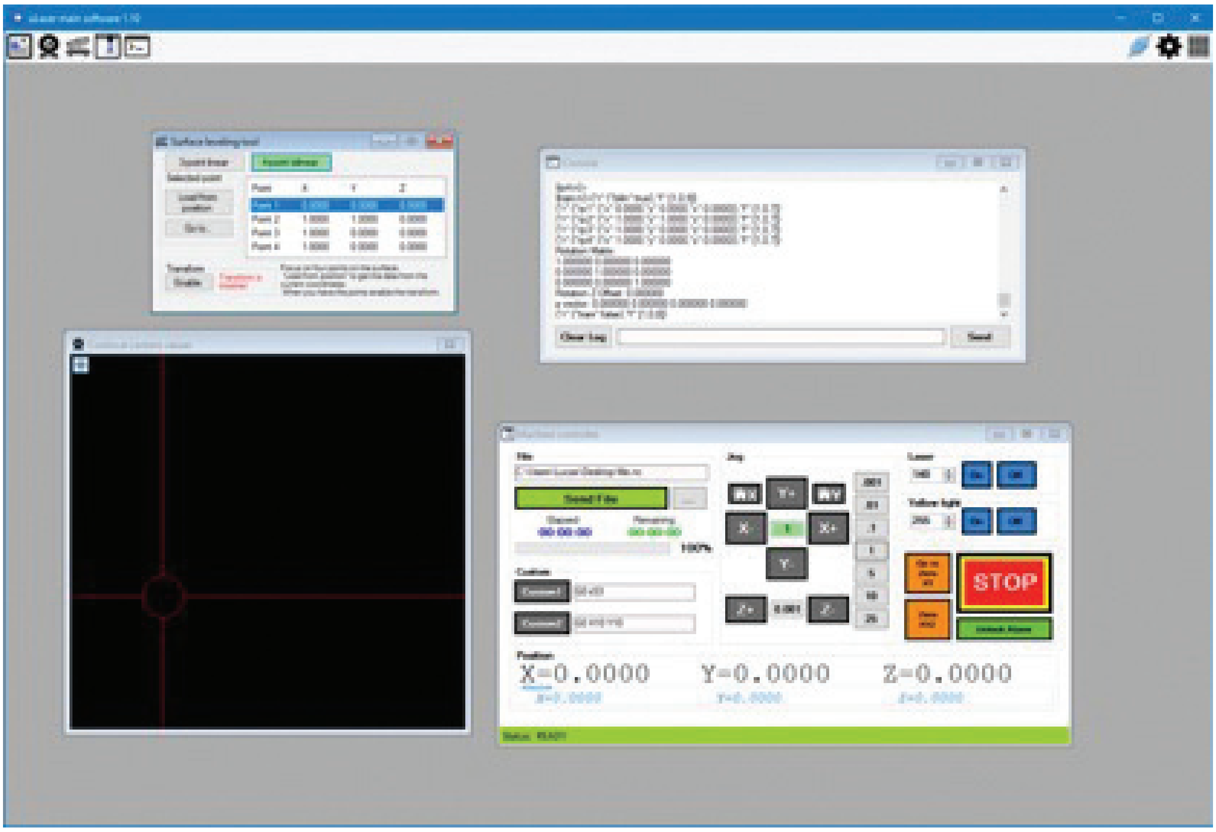
1:Imports a GDS file	10:Offset of the selected image
2:Imports a PNG file	11:Mouse function on the preview
3:List of images for writing	12:Preview
4:Changes the writing order of the images	13:Laser power and resolution panel
5:Image resizing panel	14:Stage configuration panel
6:Applies a resize operation	15:Estimated time
7:Deletes the selected image	16:Saves the preview as an image
8:Transformations panel	17:Generates the gcode file
9:Status bar	

Software

Machine control

- For someone familiar to 3d printing or CNC the controls are similar and easy to learn
- The confocal camera is used for focusing the laser around the area to write, on 3 or 4 points to level the surface.
- It can also be used as a microscope with yellow confocal light.





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Applications & segment

The best use is as a complementary tool of mask aligners. Fabrication of masks for a wide range of applications.

Research and development for Start ups, Universities and research groups.

Educational purposes

Universities, research groups working with thin films, simple lithography tasks (e.g. contact fabrications), device development, microfluidic applications, micro-electrical machines (MEMs), Bio-MEMs, etc.

Advantages:

- Low cost.
- Very robust and simple
- Reduced requirements and easier maintenance

Innovative Products for Semiconductor Processes

For more than 30 years SPS-Europe has offered quality products and services as a one-stop shopping point for front-end semiconductor manufacturers and related industries. We supply a range of industry leading products used worldwide for Wafer Handling & Automation / Wet Process & CMP / Photolith & Thin Film and the OEM Replacement parts. Dedication towards our customers and flexibility in finding the right solution, combined with solid application knowledge and fast supply logistics, are the keywords of our service. SPS-Europe B.V. is a full-service distributor offering full-time service engineer support for the systems we supply. We manufacture our own SPIN150™ and POLOS™ spin coating systems - widely installed across the world.

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