

KLOE DILASE TECHNOLOGY

26/02/2019 V14-EN



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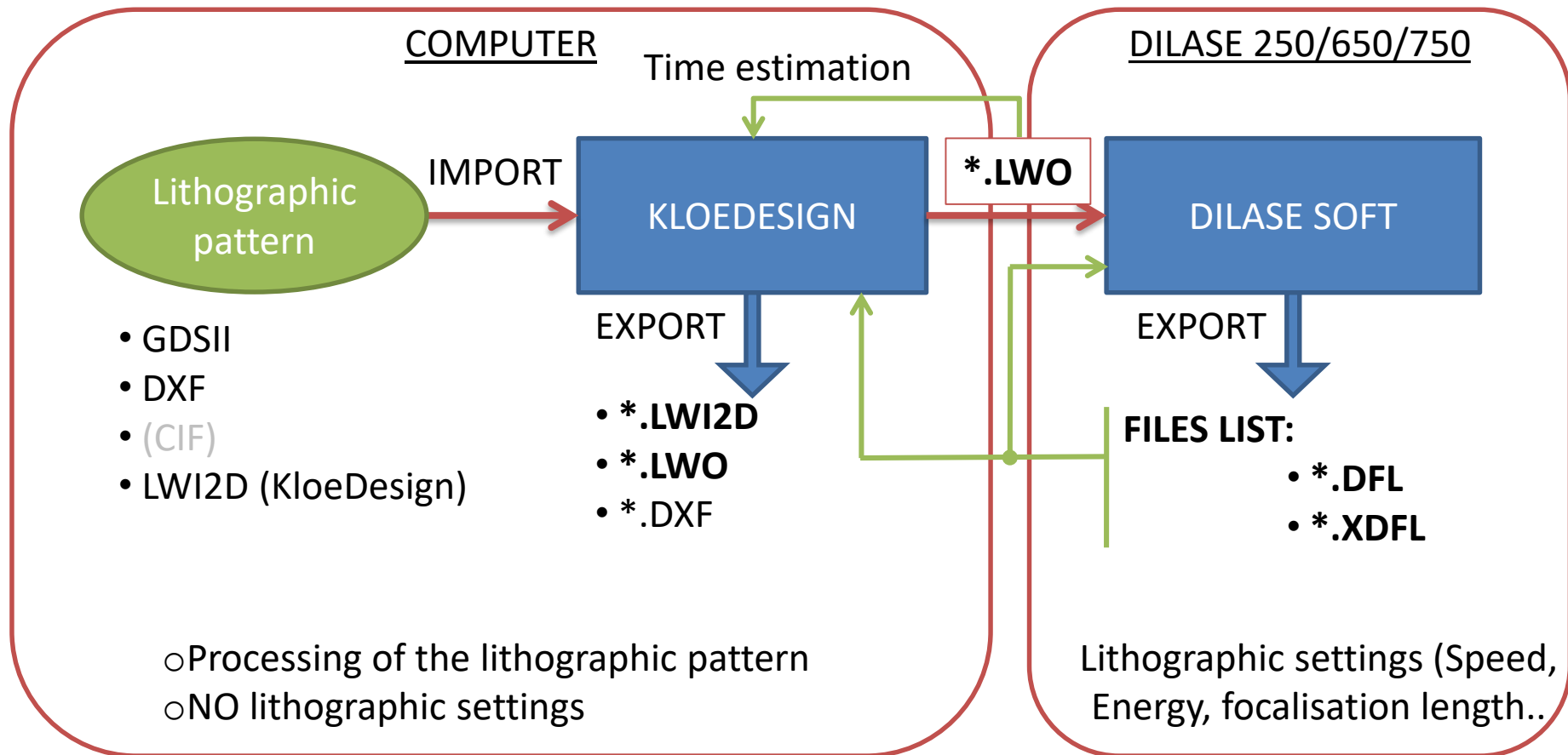
SUMMARY

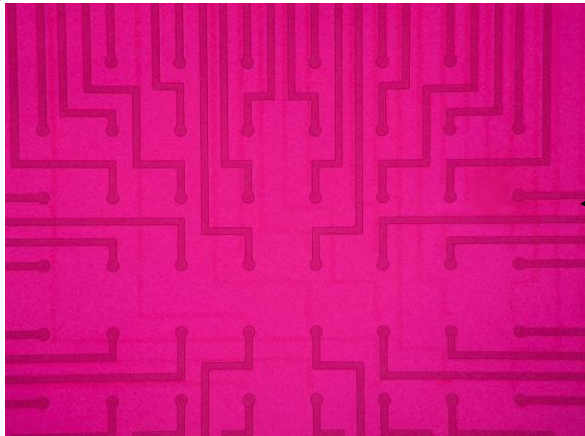
- KLOE SOFTWARE SUITE
 - KLOEDESIGN
 - Files Importation DXF-GDS
 - Machine's files generation
 - Software presentation
 - DILASESOFT
 - General interface
- Lithography settings
 - Focal length
 - Energy / speed
 - Gray scale application
 - Troubleshooting



KLOE SOFTWARE SUITE

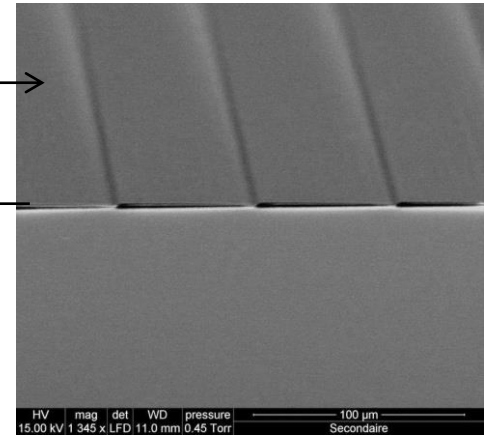
- 2 mains softwares



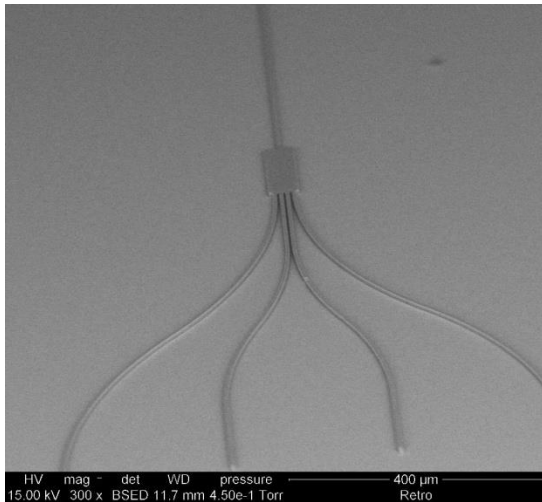


Gray-scale

Microelectronic circuit

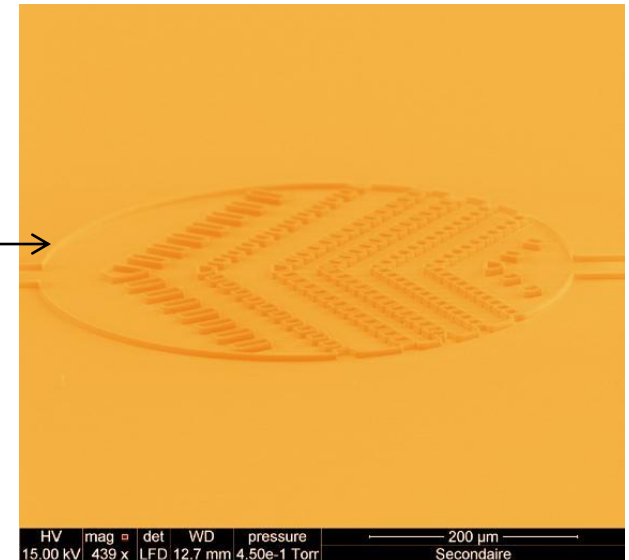


A - KLOEDESIGN



Microfluidic chip

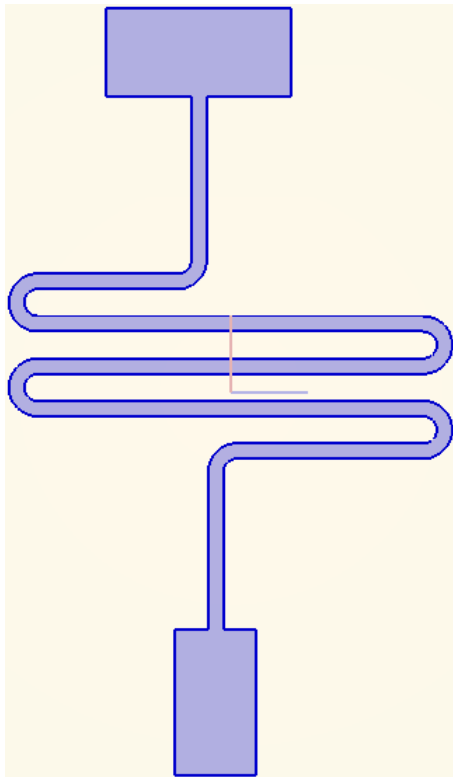
Optical component



KLOEDESIGN - Importation DXF-GDSII

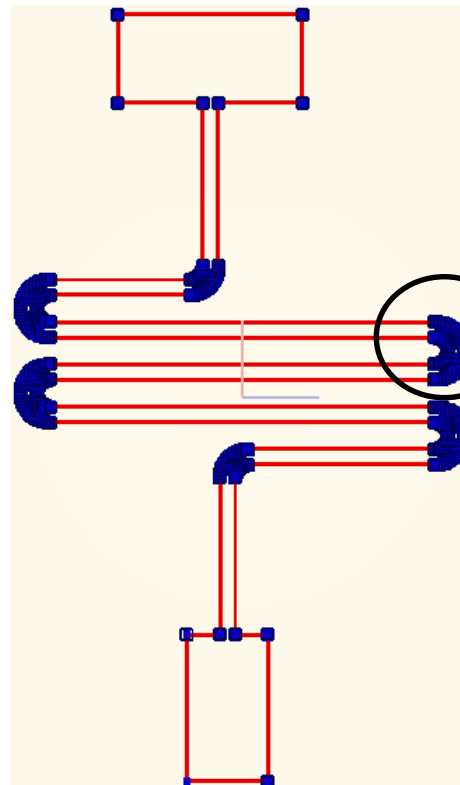
- Example : Microfluidic chip

GDSII pattern



Polygon pattern

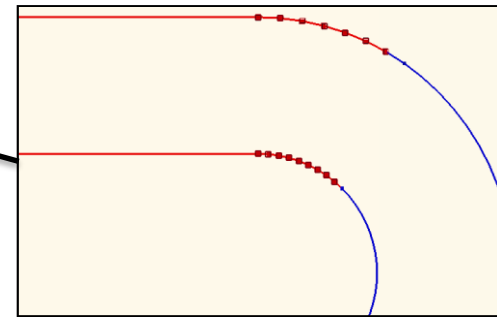
DXF pattern



Line pattern

Conception tools :

- Lines
- Arcs



Simple objects :

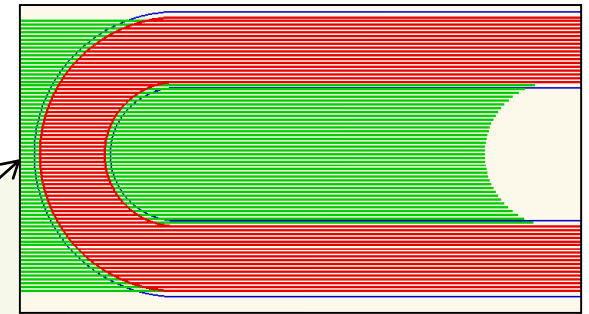
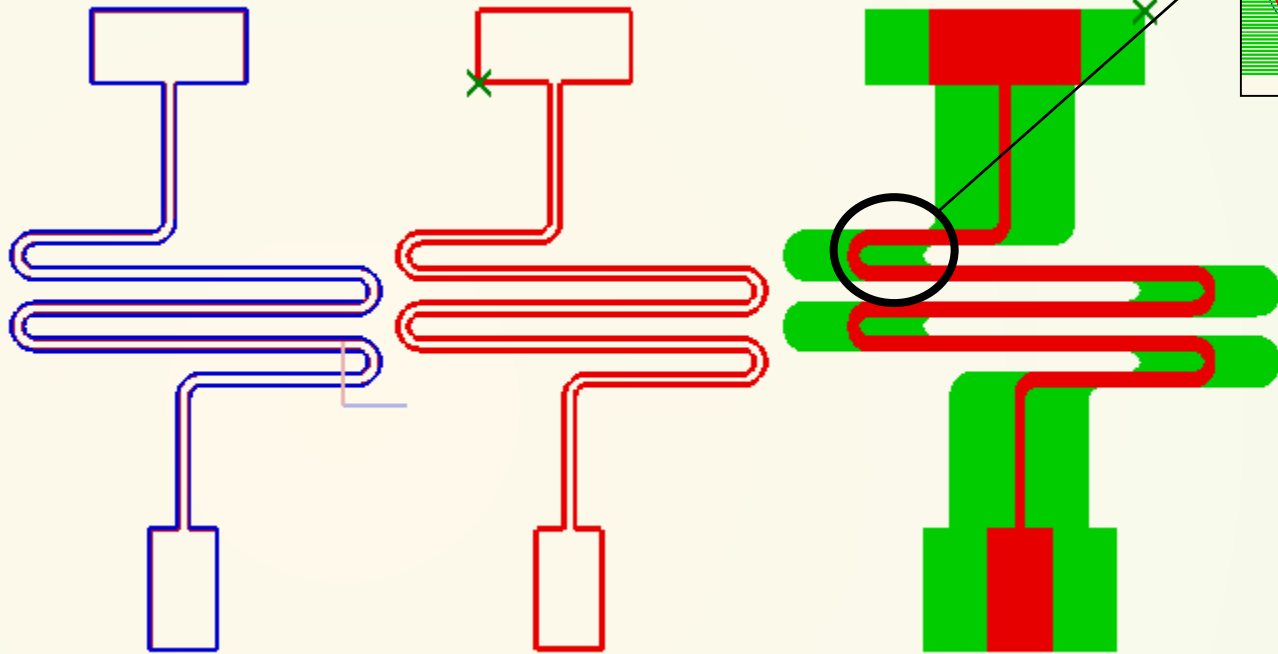
- Slower FPS 

Polygons:

- Faster FPS 

KLOEDESIGN - LWO - Machine's files generation

- Writing strategy
 - Vectorial => CONTOUR
 - Scanning => FILLING



Stabilisation length (green)
Writing lines (red)

Used for :
Time estimation related to

- Writing speed
- Replacement speed

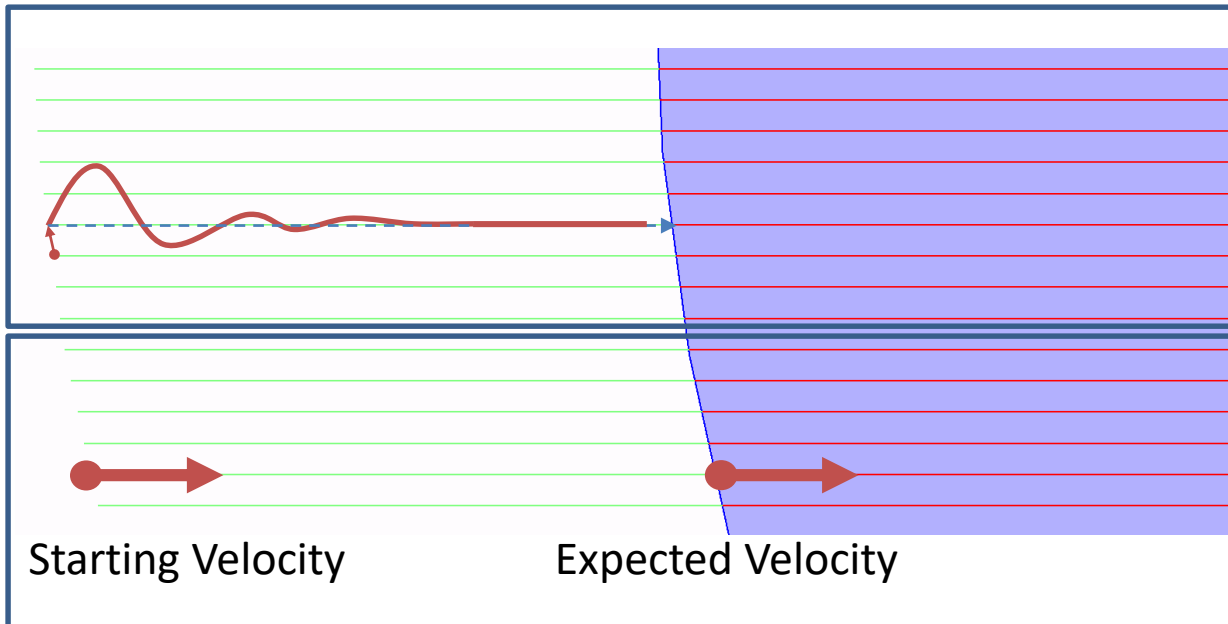
Lwi2d

Contour.LWO

Filling.LWO

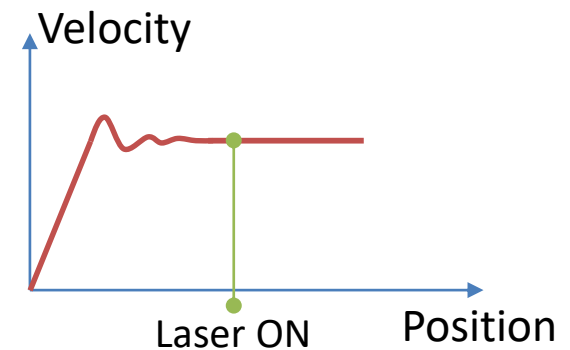
KLOEDESIGN - LWO - Machine's files generation

- Stabilisation length



Used to :

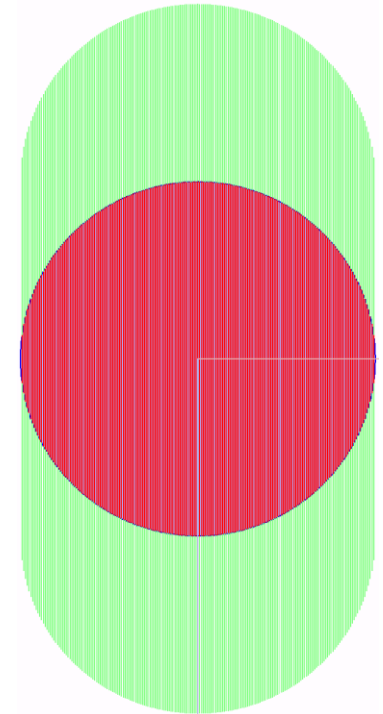
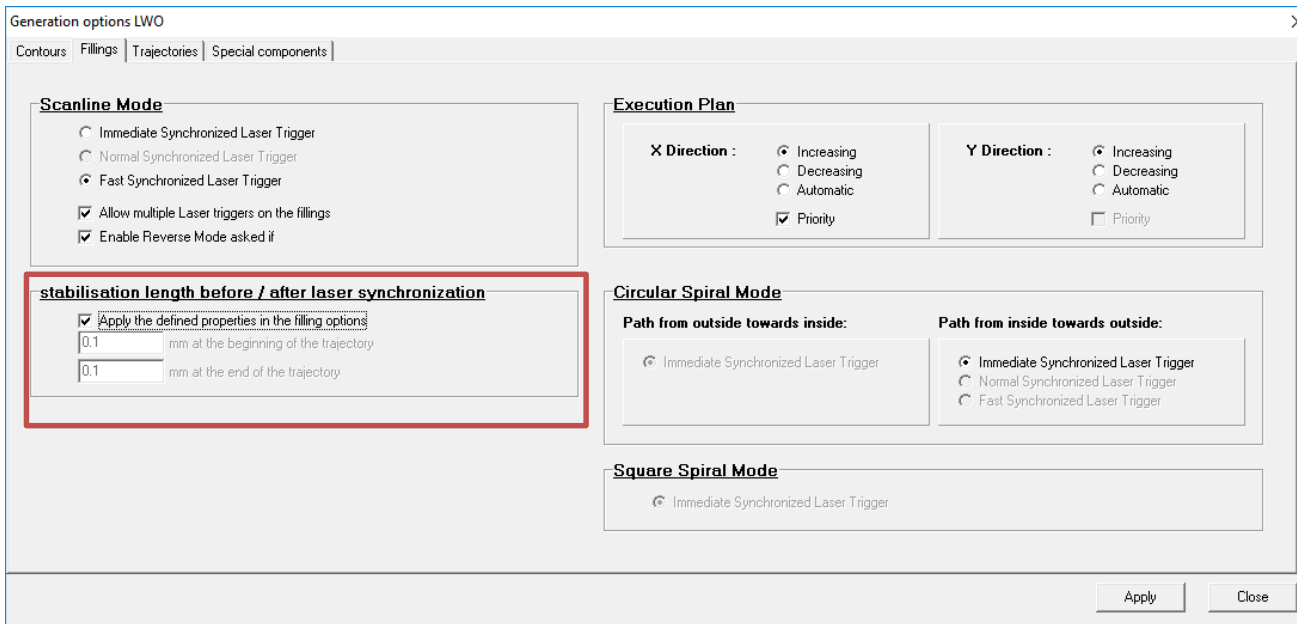
- Stabilise the stages
- Reach the writing speed requested



Note: This value have to be adjusted in function of writing speed

KLOEDESIGN - LWO - Machine's files generation

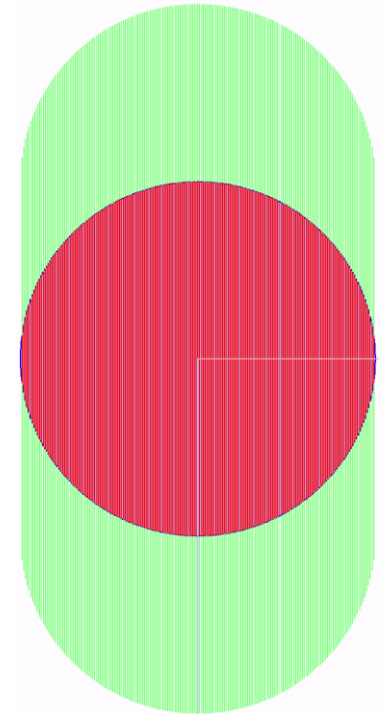
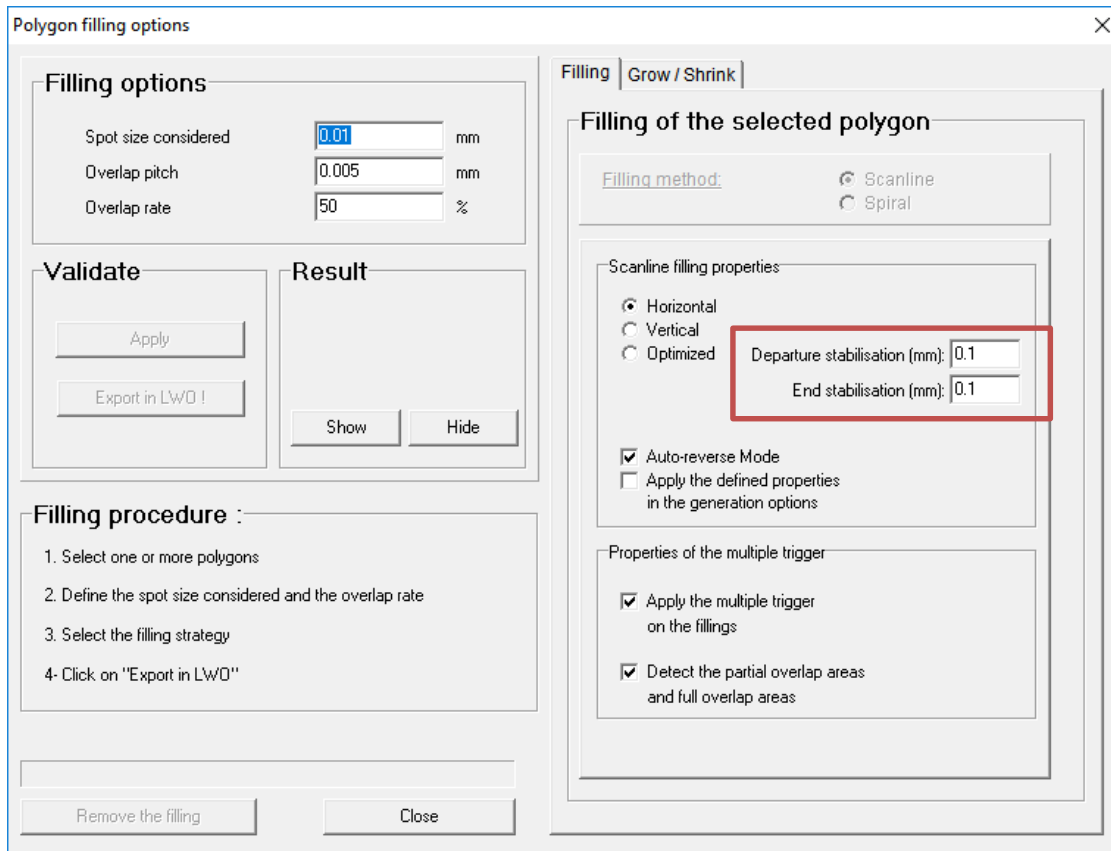
- Stabilisation length - Fillings



Note: This value have to be adjusted in function of writing speed

KLOEDESIGN - LWO - Machine's files generation

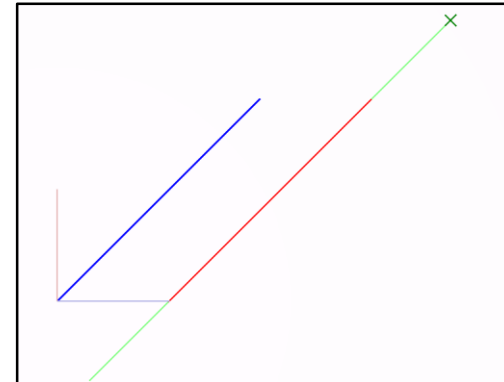
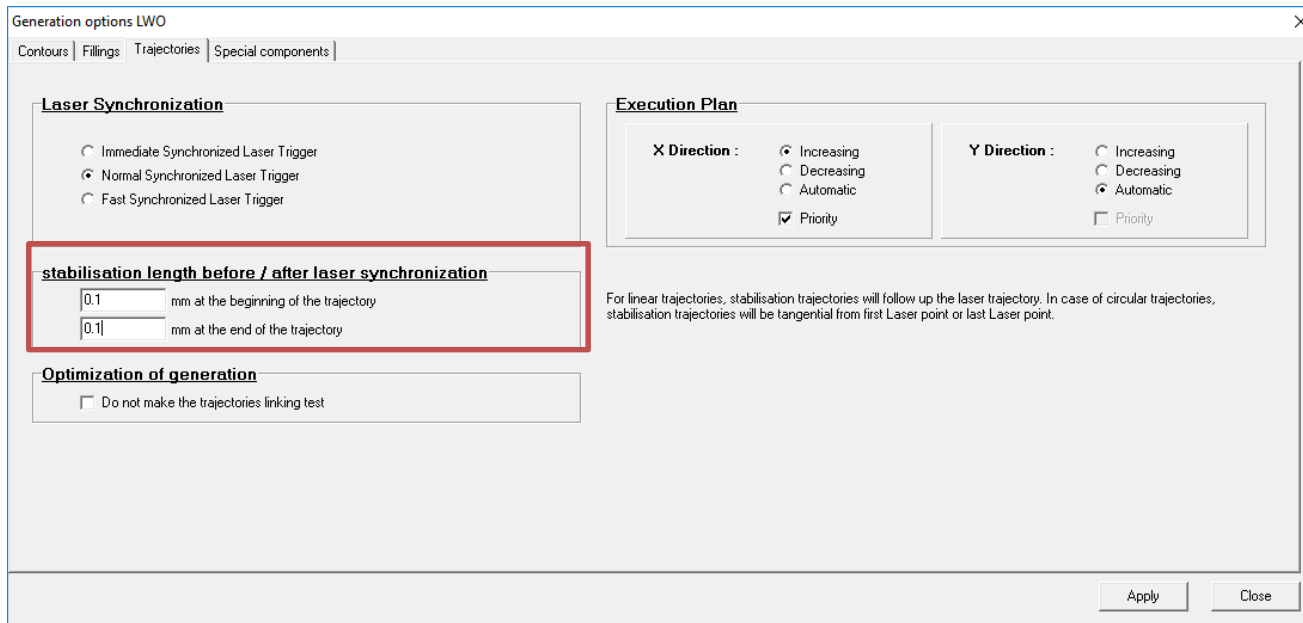
- Stabilisation length - Fillings



Note: This value have to be adjusted in function of writing speed

KLOEDESIGN - LWO - Machine's files generation

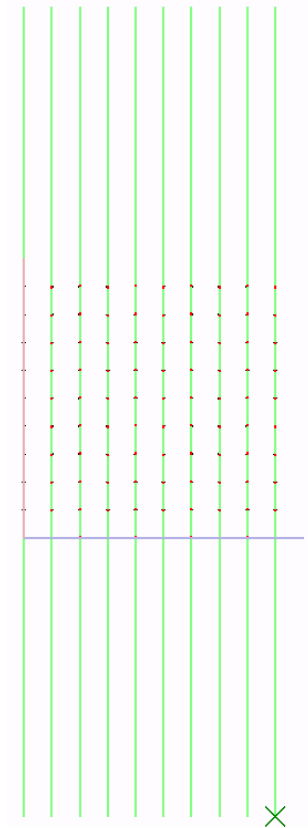
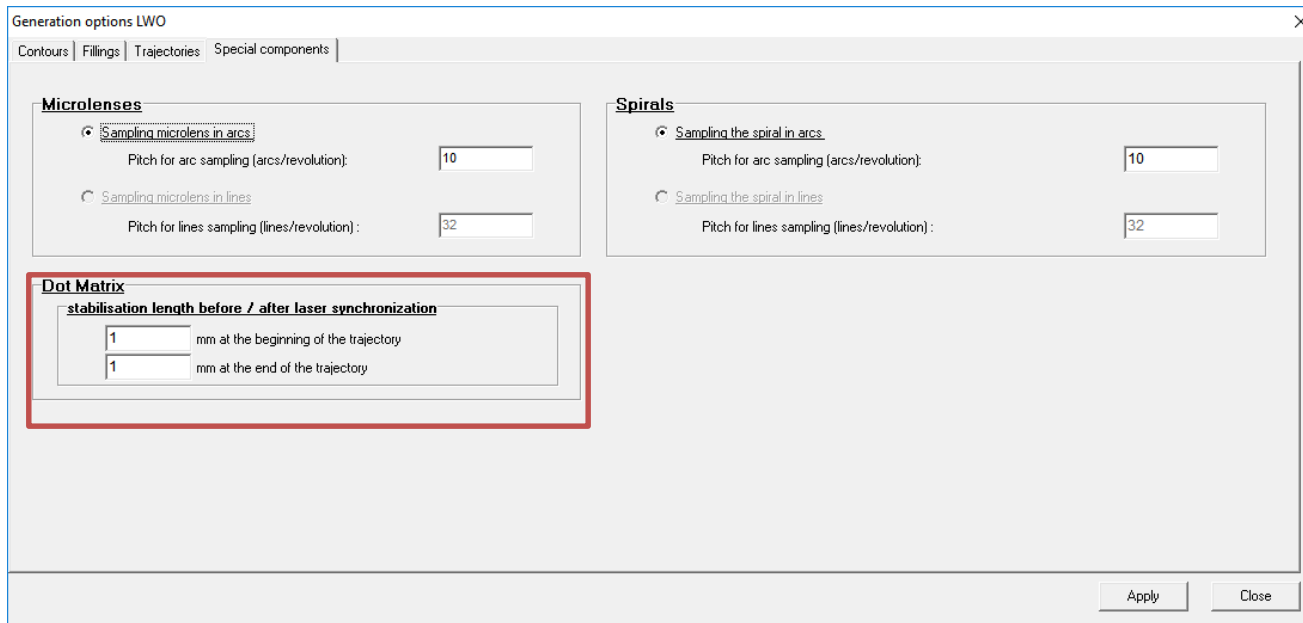
- Stabilisation length - Trajectories



Note: This value have to be adjusted in function of writing speed

KLOEDESIGN - LWO - Machine's files generation

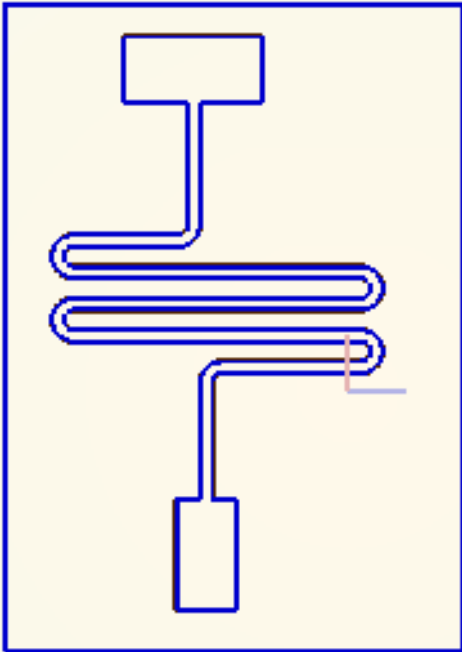
- Stabilisation length – Dot Matrix



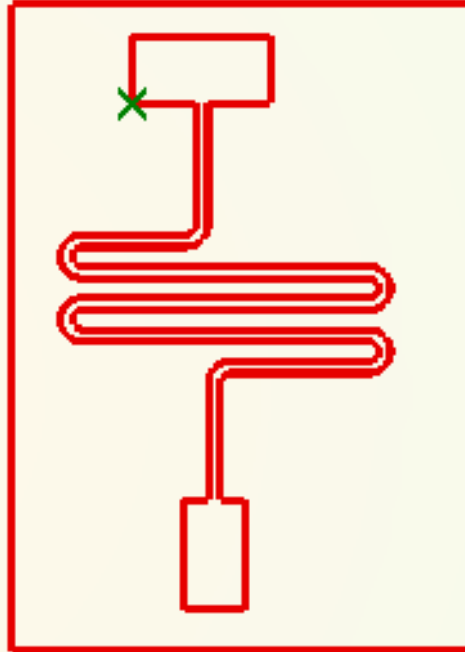
Note: This value have to be adjusted in function of writing speed

KLOEDESIGN - LWO - Machine's files generation

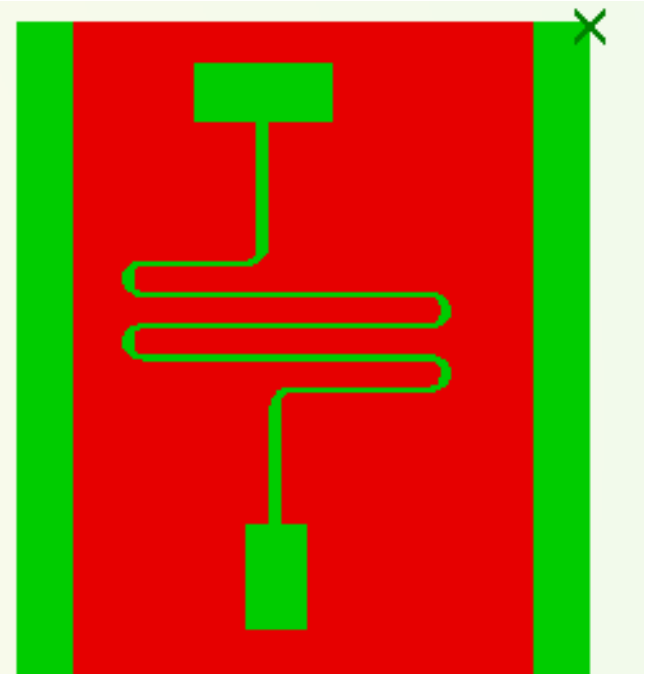
- Circuit conception
 - Positive pattern



Lwi2d



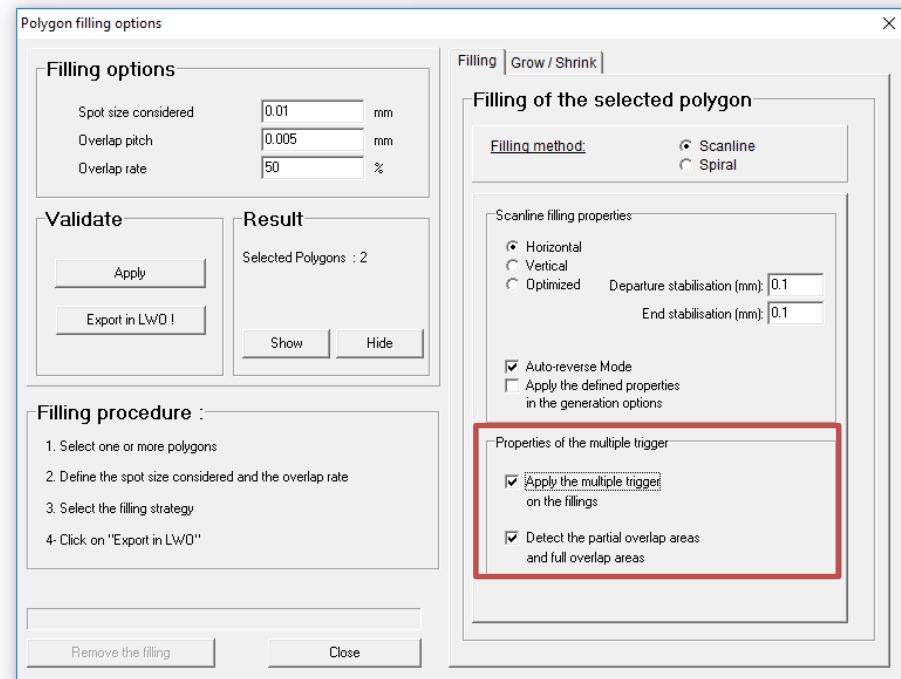
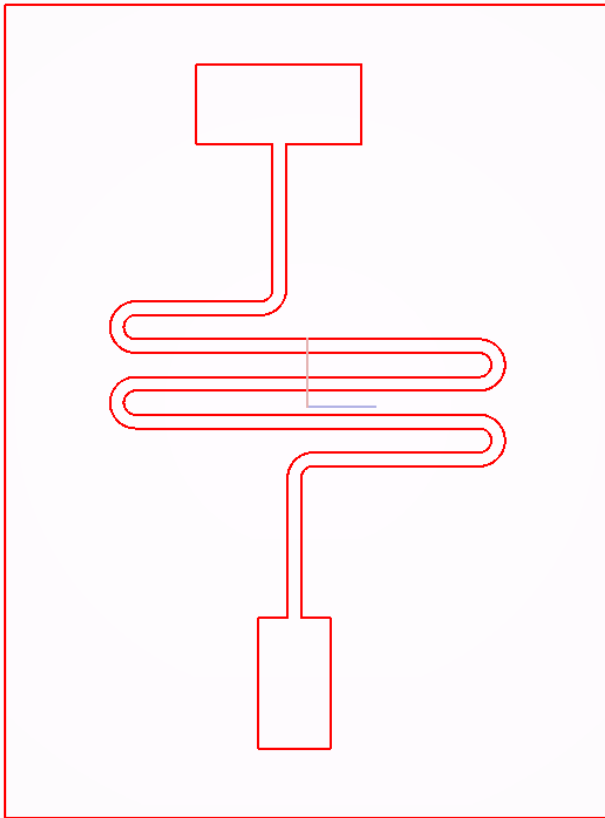
Contour.LWO



Filling.LWO

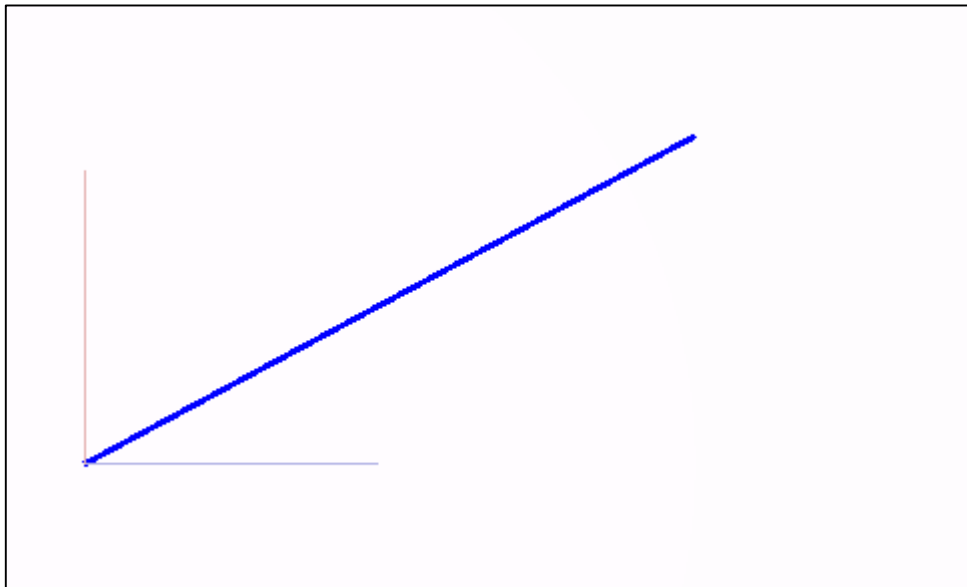
KLOEDESIGN - LWO - Machine's files generation

- Circuit conception
 - Positive pattern



KLOEDESIGN – Design basic function

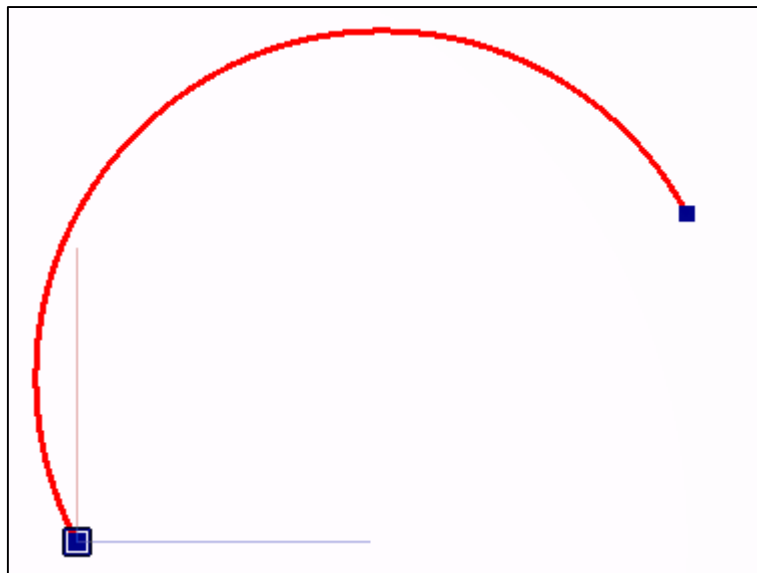
- Circuit conception
 - CAD tools - Line



Properties :	Value :
Name	Line 7004
Color	
Reference	Start section
Position x (mm)	0.000000
Position y (mm)	0.000000
Section width (mm)	0.000001
Angle Theta	28.233387
Length (mm)	2.369959

KLOEDESIGN – Design basic function

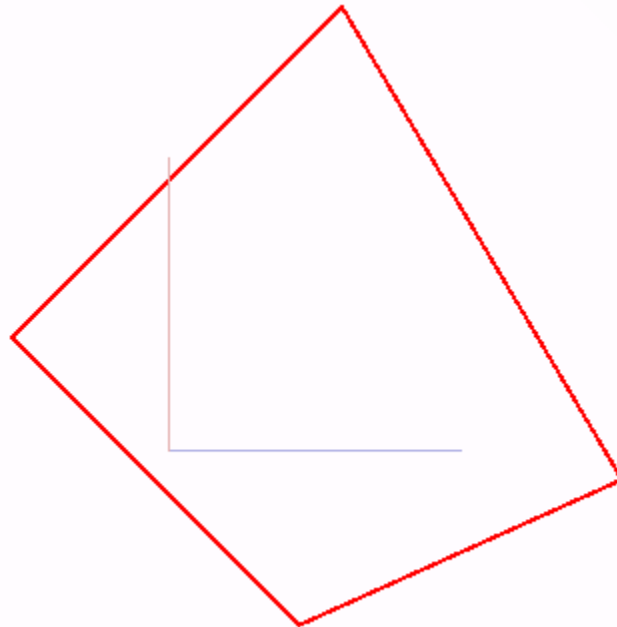
- Circuit conception
 - CAD tools - Arc




Properties :	Value :
Name	Arc 7007
Color	
Reference	Start section
Position x (mm)	0.000000
Position y (mm)	0.000000
Section width (mm)	0.000001
Departure angle	208.233387
Length (mm)	3.722723
Curvature radius (mm)	1.184979
Curvature center X	1.044000
Curvature center Y	0.560571
Curvature angle	-180.000000

KLOEDESIGN – Design basic function

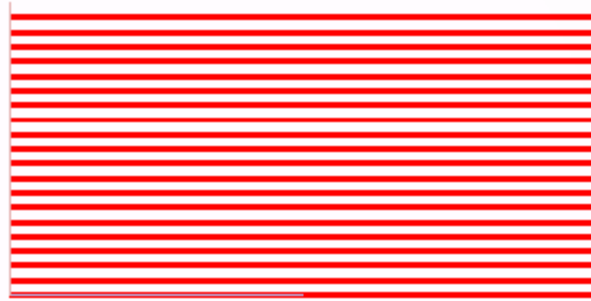
- Circuit conception
 - CAD tools - Polygon



Properties :	Value :
Name	Polygon 7010
Color	
Position x (mm)	0.000000
Position y (mm)	0.000000
Angle Theta	0.000000
Nb Points	4
Sections	Inactives
Points	Edit...
Fill	None
Remove the filling	None

KLOEDESIGN – Design basic function

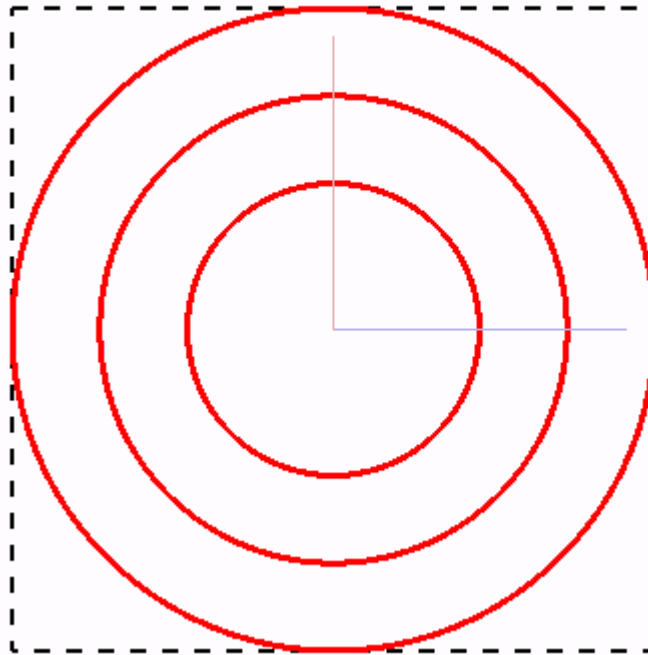
- Circuit conception
 - CAD tools – Line array



Properties :	Value :
Name	Array 7015
Color	
Number of lines	20
Position x (mm)	0.000000
Position y (mm)	0.000000
Angle Theta	0.000000
Section width (mm)	0.000001
Autoreverse mode	yes
Length	2.000000
Variation x (mm)	0.000000
Variation y (mm)	0.050000
Delta Variation x (mm)	0.000000
Delta Variation y (mm)	0.000000

KLOEDESIGN – Design basic function

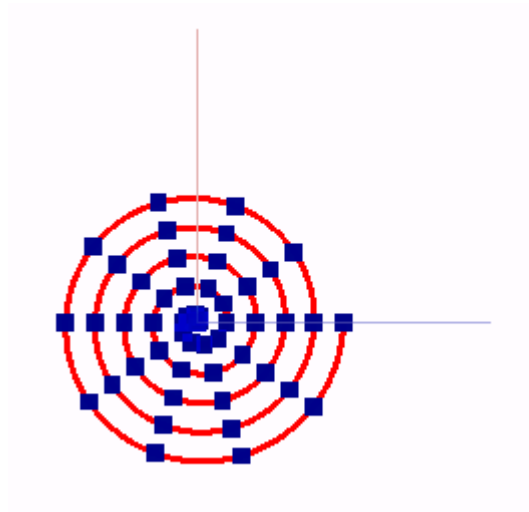
- Circuit conception
 - CAD tools – Circle array



Properties :	Value :
Name	Circle Array 7136
Color	
Number of circle	3
Position x (mm)	0.000000
Position y (mm)	0.000000
Angle Theta	0.000000
Section width (mm)	0.000001
Smaller radius	0.500000
Radius variation	0.300000
Curvature angle	360.000000

KLOEDESIGN – Design basic function

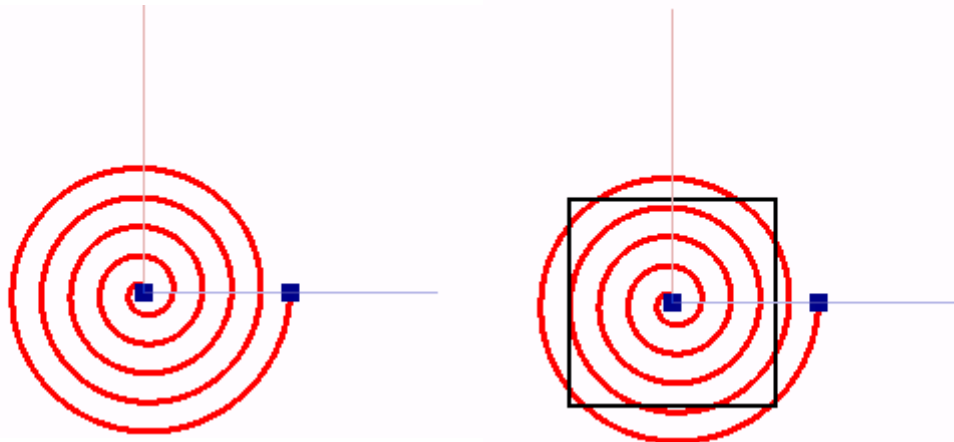
- Circuit conception
 - CAD tools - Spiral



Properties :	Value :
Name	Spiral 7155
Color	
Reference	Start section
Position x (mm)	0.000000
Position y (mm)	0.000000
Section width (mm)	0.006500
Angle Theta	0.000000
Length (mm)	7.890910
Number of spires	5.000000
Variation step of spire (mm)	0.100000
Max radius(mm)	0.500000
Course direction	Counterclockwise

KLOEDESIGN – Design basic function

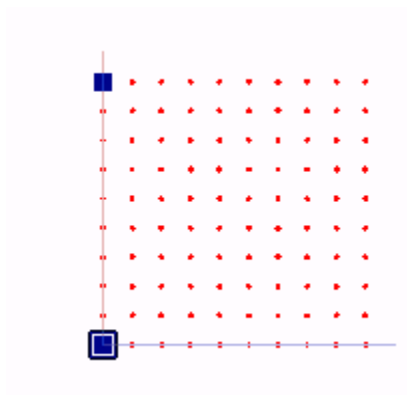
- Circuit conception
 - CAD tools - Microlens



Properties :	Value :
Name	Microlentille 7262
Color	
Reference	Start section
Position x (mm)	0.000000
Position y (mm)	0.000000
Section width (mm)	0.000001
Angle Theta	0.000000
Length (mm)	7.890910
Number of spires	5.000000
Variation step of spire (mm)	0.100000
Max radius(mm)	0.500000
Course direction	Counterclockwise
Mask	NO

KLOEDESIGN – Design basic function

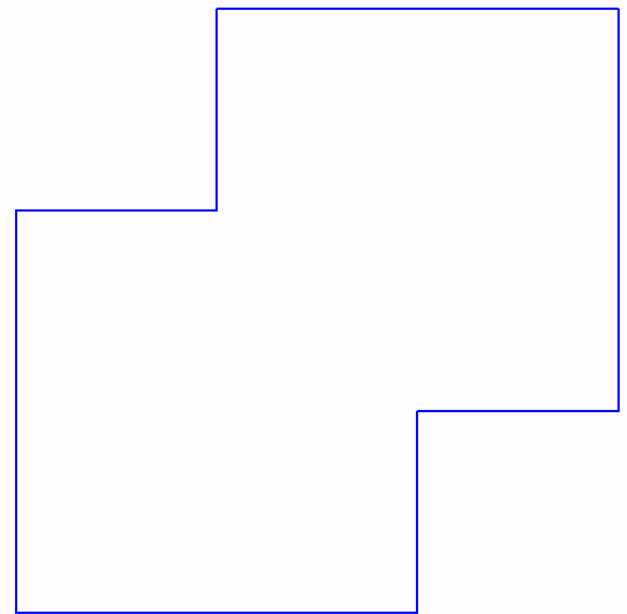
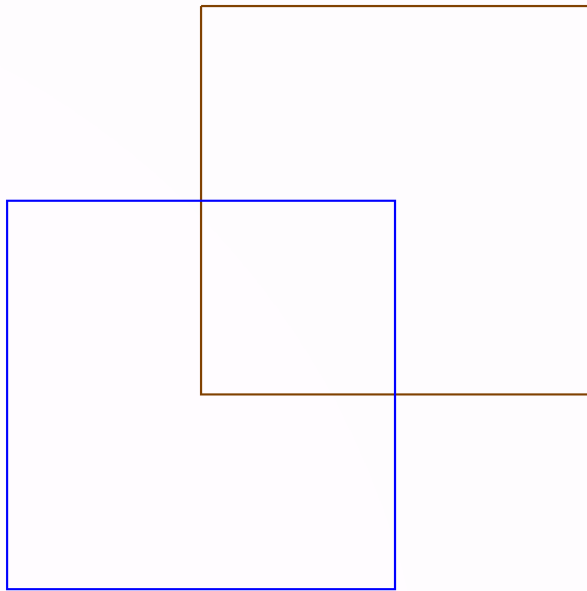
- Circuit conception
 - CAD tools – Dot Matrix



Properties :	Value :
Name	Dot Matrix 7371
Color	
Reference	Start section
Position x (mm)	0.000000
Position y (mm)	0.000000
Section width (mm)	0.006500
Length (mm)	0.900000
Width (mm)	0.900000
Number of items on X axis	10
Number of items on Y axis	10
X pitch (mm)	0.100000
Y pitch (mm)	0.100000
Writing Direction	Horizontal
Auto-reverse	Yes
Dot type	Square
Trajectory visible	No
Matrix type	Normal

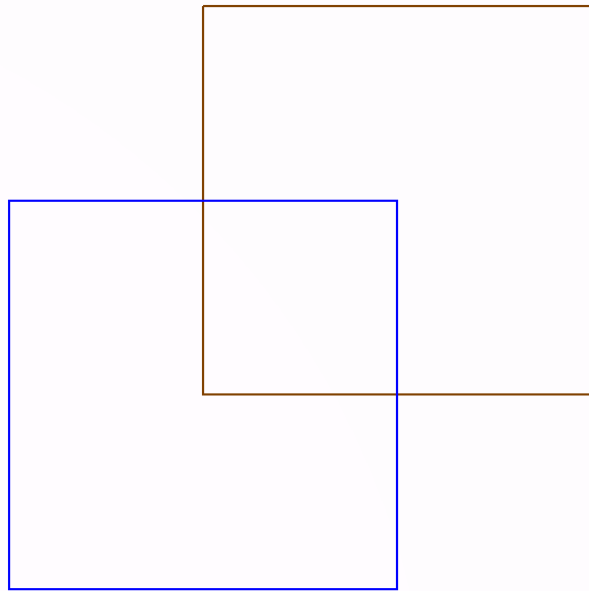
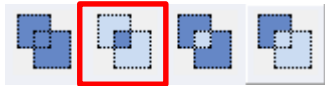
KLOEDESIGN – Design basic function

- Circuit conception
 - CAD functions - Merge



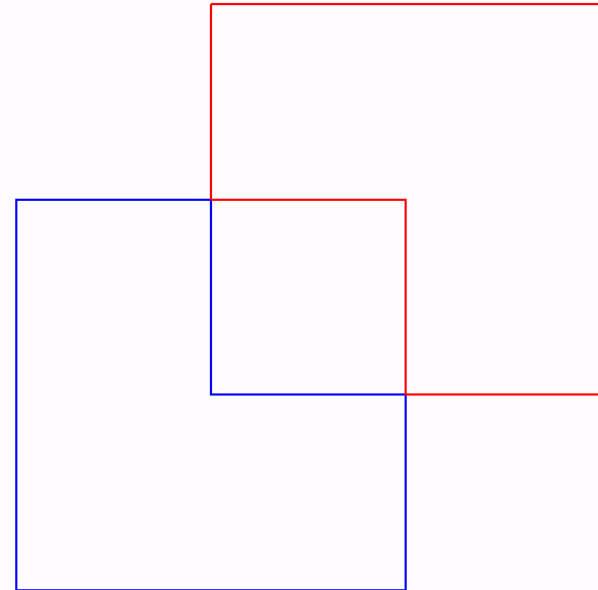
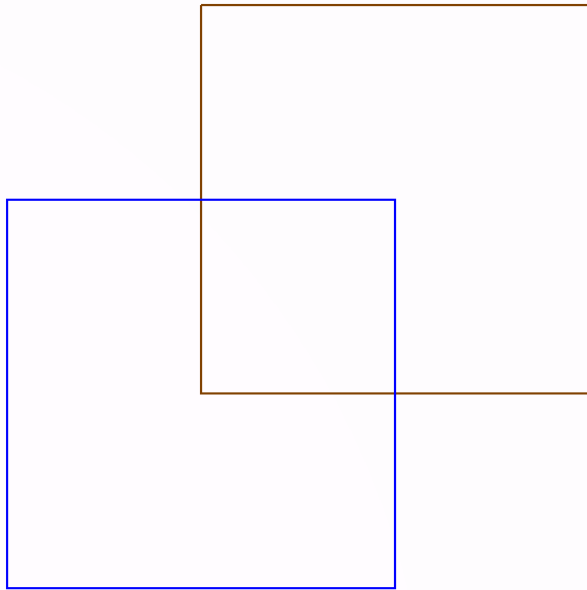
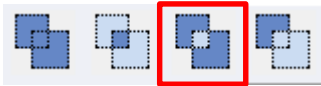
KLOEDESIGN – Design basic function

- Circuit conception
 - CAD functions - Intersect



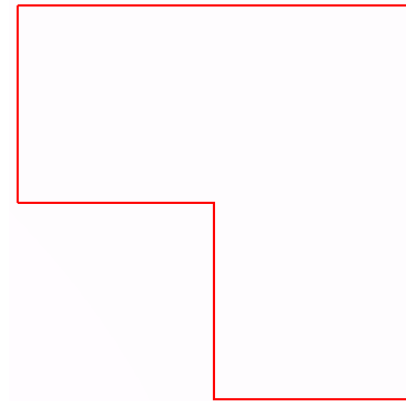
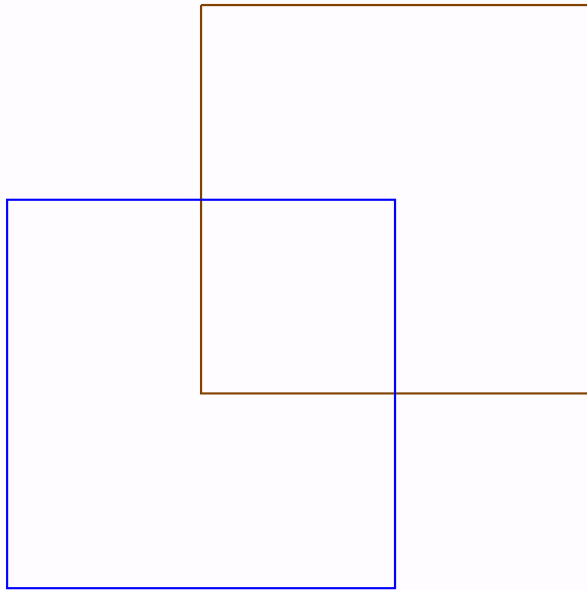
KLOEDESIGN – Design basic function

- Circuit conception
 - CAD functions - XOR

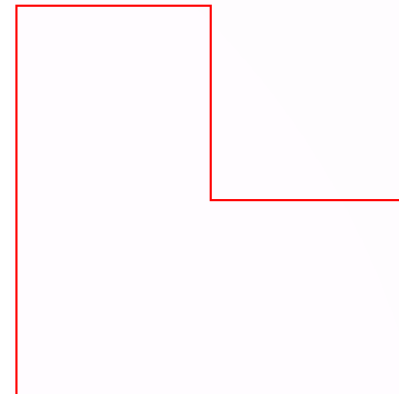


KLOEDESIGN – Design basic function

- Circuit conception
 - CAD functions - Substraction

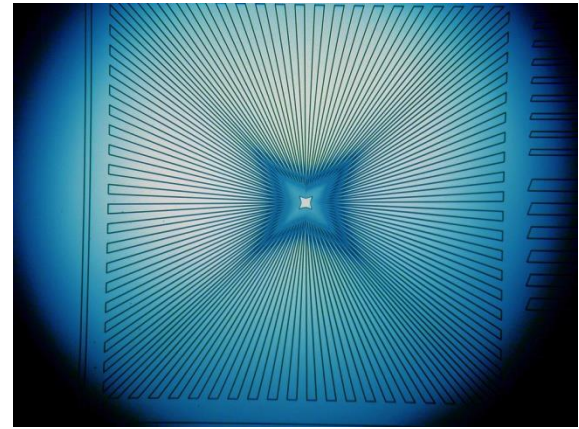
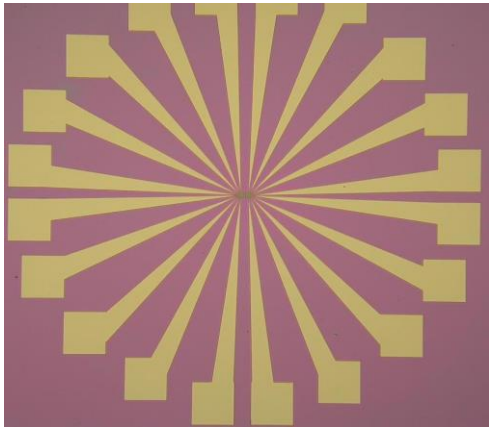


OR

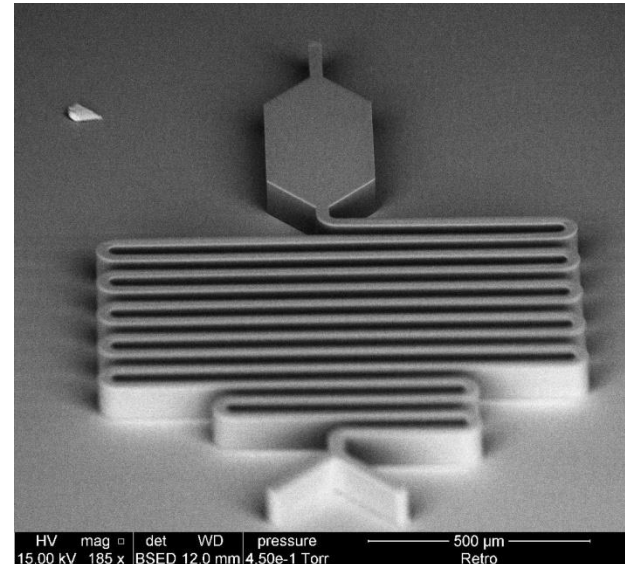
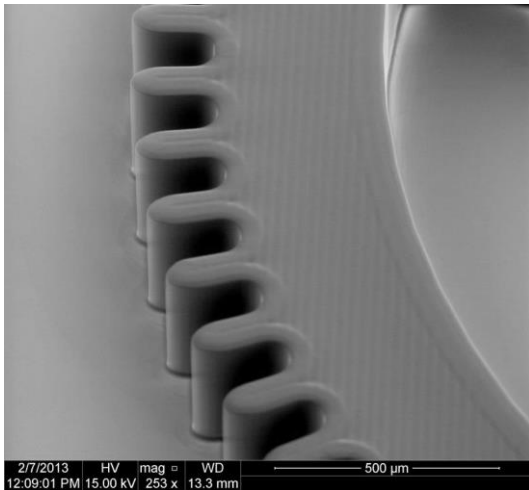


Software presentation





B - DilaseSoft



DILASESOFT

- DilaseSoft General interface

The screenshot displays the DilaseSoft 650 software interface, which is divided into several functional panels:

- Init process:** Contains a dropdown menu for "Pre-configured initialisation file" (currently set to "INITIALISATION") and an "Initialization" button.
- Laser:** Divided into three sections:
 - Laser:** Buttons for "Laser 375nm" (with a green checkmark) and "Laser 405nm".
 - Active line:** Buttons for "Line 1µm" and "Line 10µm" (with a green checkmark).
 - Power control:** "Laser key : Active", "State Laser" (with a sun icon), "Laser ON" and "Laser OFF" buttons, a "Modulation" slider (set to 100.0%), and "Wait time before usage : Used".
- Visualisation:** Shows a dark image with "Zoom : X 1.00" and "RGB32 1600x1200". Below the image are controls for "Numerical magnification", "Light Intensity Level" (set to 100), and checkboxes for "Turn ON light", "Camera Parameters", "Reticle Reference 1µm @ 375nm", "External window", "Reticle used 10µm @ 375nm", and "Angular compensation...".
- Engine control panel:** Features a central joystick with four blue arrows. To its right are controls for "Position X (mm)", "Position Y (mm)", and "Velocity (mm/s)". Each has a "Set zero", "Go absolute", and "Go relative" button. The "Velocity" section has "Fast" (10), "Normal" (5), and "Slow" (0.5) buttons. A "Repositioning velocity (mm/s)" field is set to 17. A "Focusing stage" section on the right includes "Current position Z (mm) : 0.013", "RAZ", "Reach:" (0), "Go absolute", "Relative up", "Relative down", and "Velocity (mm/sec)" buttons for "Fast", "5", "slow", and "0.5". A "Keyboard shortcuts" checkbox is also present.
- Lithography:** Includes a "Files to process" list with columns for "File", "Modulation", "Velocity", "Offset X", "Offset Y", "Z Position", "Writing mode", "Energy variation", "Velocity variation", and "Exposure time". A "Start" button is at the bottom left of this panel.
- Sensors state:** Shows "Front window : OK" with a green indicator and "VACUUM : MISSING" with a yellow warning icon.

At the bottom center of the interface, the text "No LWO transformation defined" is displayed.

DILASESOFT

- DilaseSoft General interface

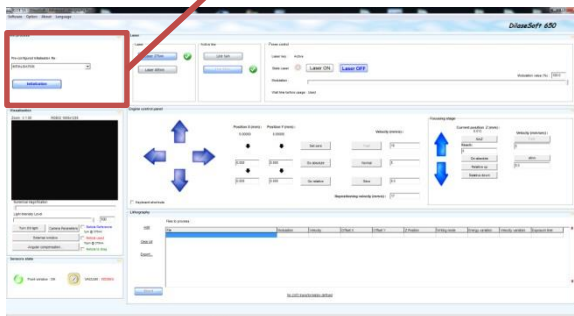
The screenshot displays the DilaseSoft 650 software interface, which is used for lithography. The interface is divided into several functional panels:

- Init process:** Contains a dropdown menu for the pre-configured initialisation file (set to 'INITIALISATION') and an 'Initialization' button. **1**
- Laser:** Features buttons for 'Laser 375nm', 'Laser 405nm', 'Line 1µm', and 'Line 10µm'. It also includes a 'Power control' section with 'Laser ON' and 'Laser OFF' buttons, a 'Modulation' slider, and a 'Wait time before usage' indicator. **2**
- Visualisation:** Shows a live camera feed of the lithography stage. Below the feed are controls for 'Numerical magnification', 'Light Intensity Level', and 'Turn ON light'. **4**
- Engine control panel:** Provides manual control over the stage with directional arrows, position (X and Y in mm) and velocity (mm/s) inputs, and buttons for 'Set zero', 'Go absolute', and 'Go relative'. **3**
- Focusing stage:** Includes a 'Current position Z (mm)' display, a 'Reach' input, and buttons for 'Go absolute', 'Relative up', and 'Relative down'. **5**
- Lithography:** A table for defining 'Files to process' with columns for File, Modulation, Velocity, Offset X, Offset Y, Z Position, Writing mode, Energy variation, Velocity variation, and Exposure time. A 'Start' button is located at the bottom. **6**

Additional interface elements include a 'Sensors state' panel at the bottom left showing 'Front window : OK' and 'VACUUM : MISSING', and a menu bar at the top with 'Software', 'Option', 'About', and 'Language'.

DILASESOFT

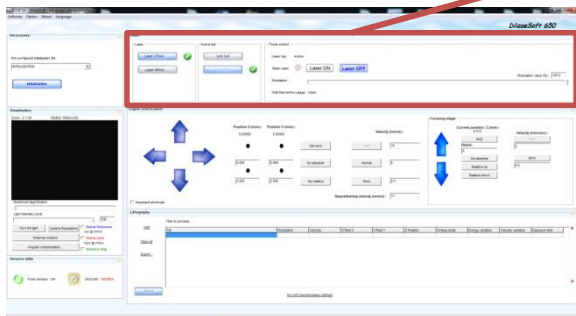
- DilaseSoft General interface
 - Initialisation



○ Initialize the equipment

DILASESOFT

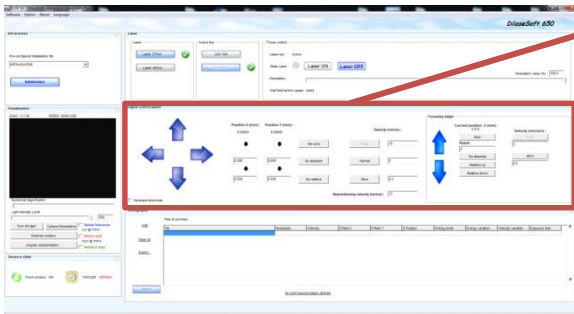
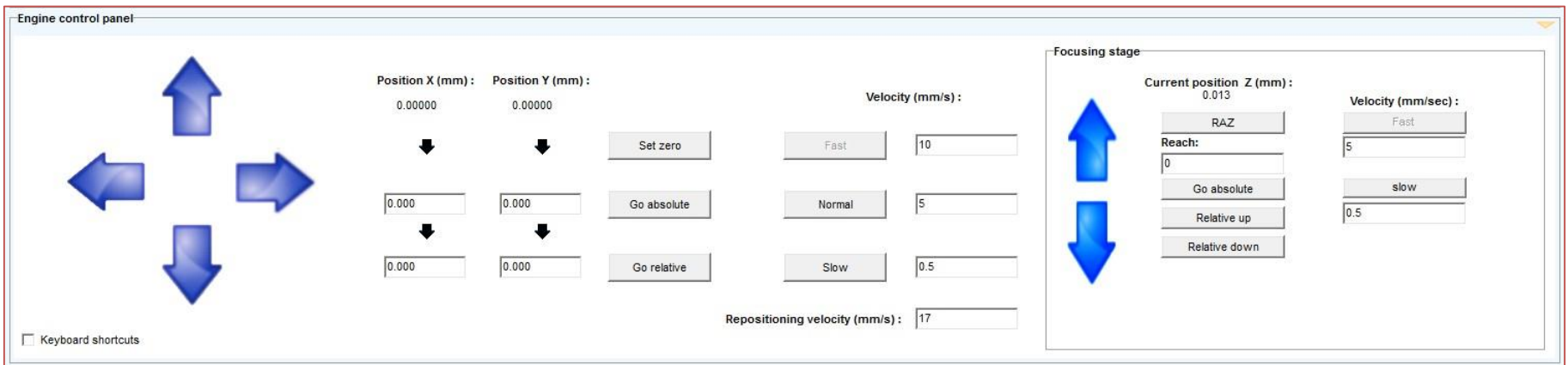
- DilaseSoft General interface
 - Laser



- Information about the selected laser source
- Selects an optical line
- Allows switching on/off the laser

DILASESOFT

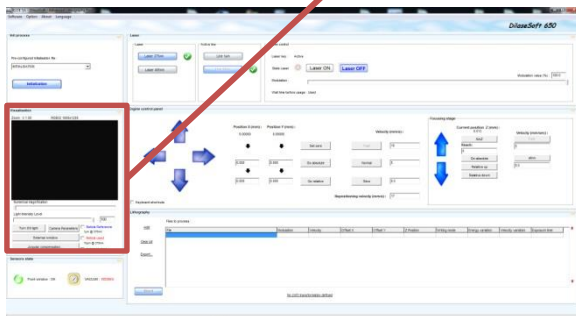
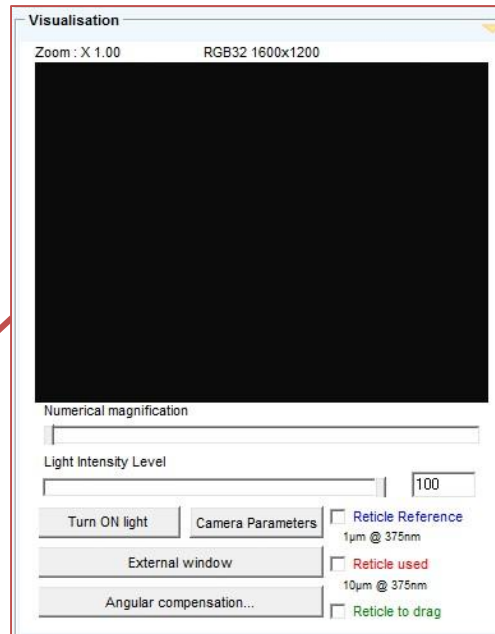
- DilaseSoft General interface
 - Engine control panel



- Enables the user to move the motorised stages
- Allows to control the focusing device

DILASESOFT

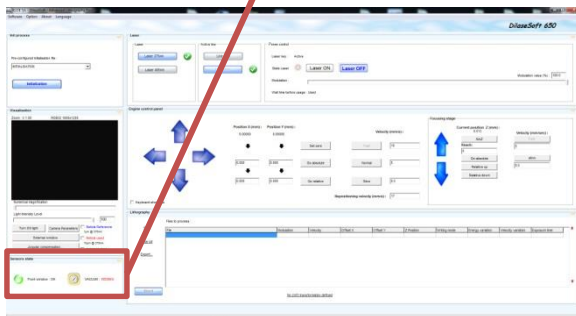
- DilaseSoft General interface
 - Visualisation



- Allows sample viewing
- Allows positioning reticules
- Helps to realign for multilayer pattern
- Allows an angular compensation

DILASESOFT

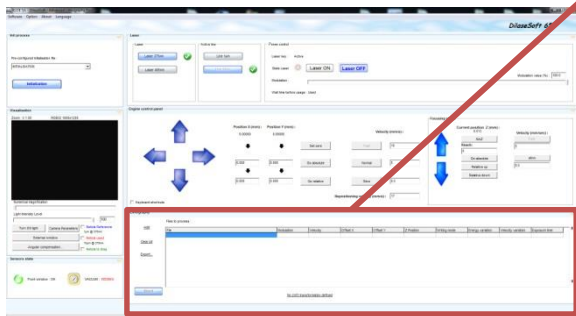
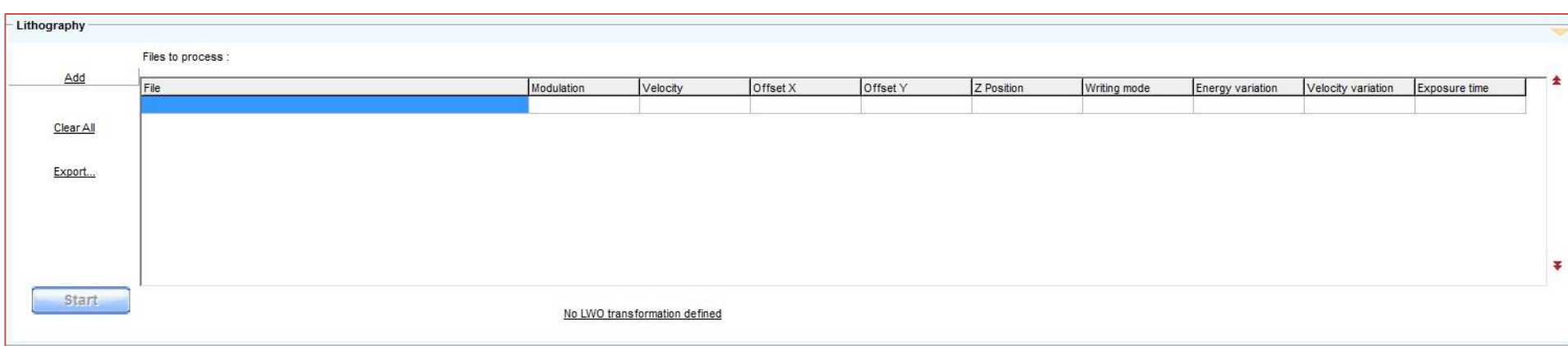
- DilaseSoft General interface
 - Sensors state



- Information about the window in open or closed state
- Activate the vacuum on the sample holder

DILASESOFT

- DilaseSoft General interface
 - Lithography



- Allows to add lithographic files to the list
- Sets the writing parameters
- Allows to export a lithographic pattern
- Allows to start writing

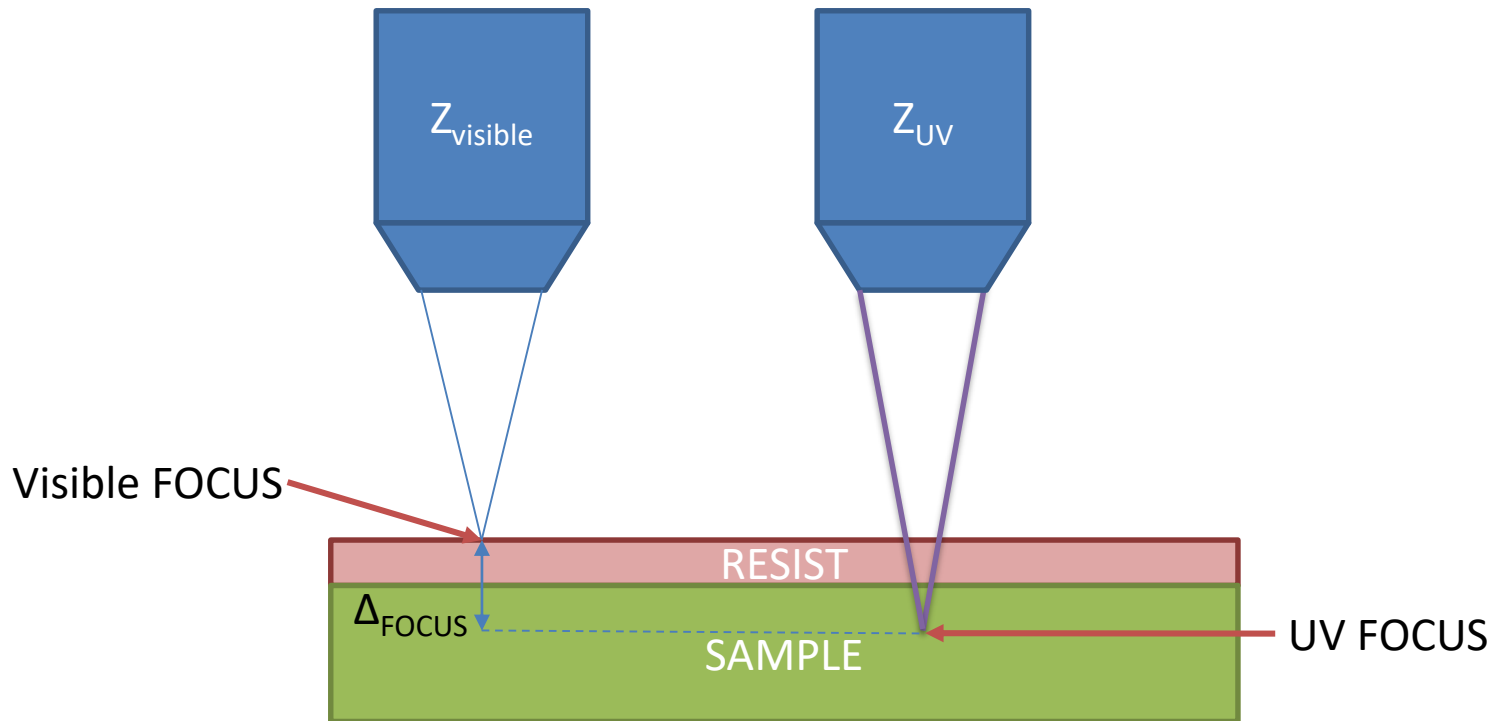
Lithographic settings

- Focal length
- Energy to apply
- Writing speed
- Gray-Scale



Setting of the focusing height

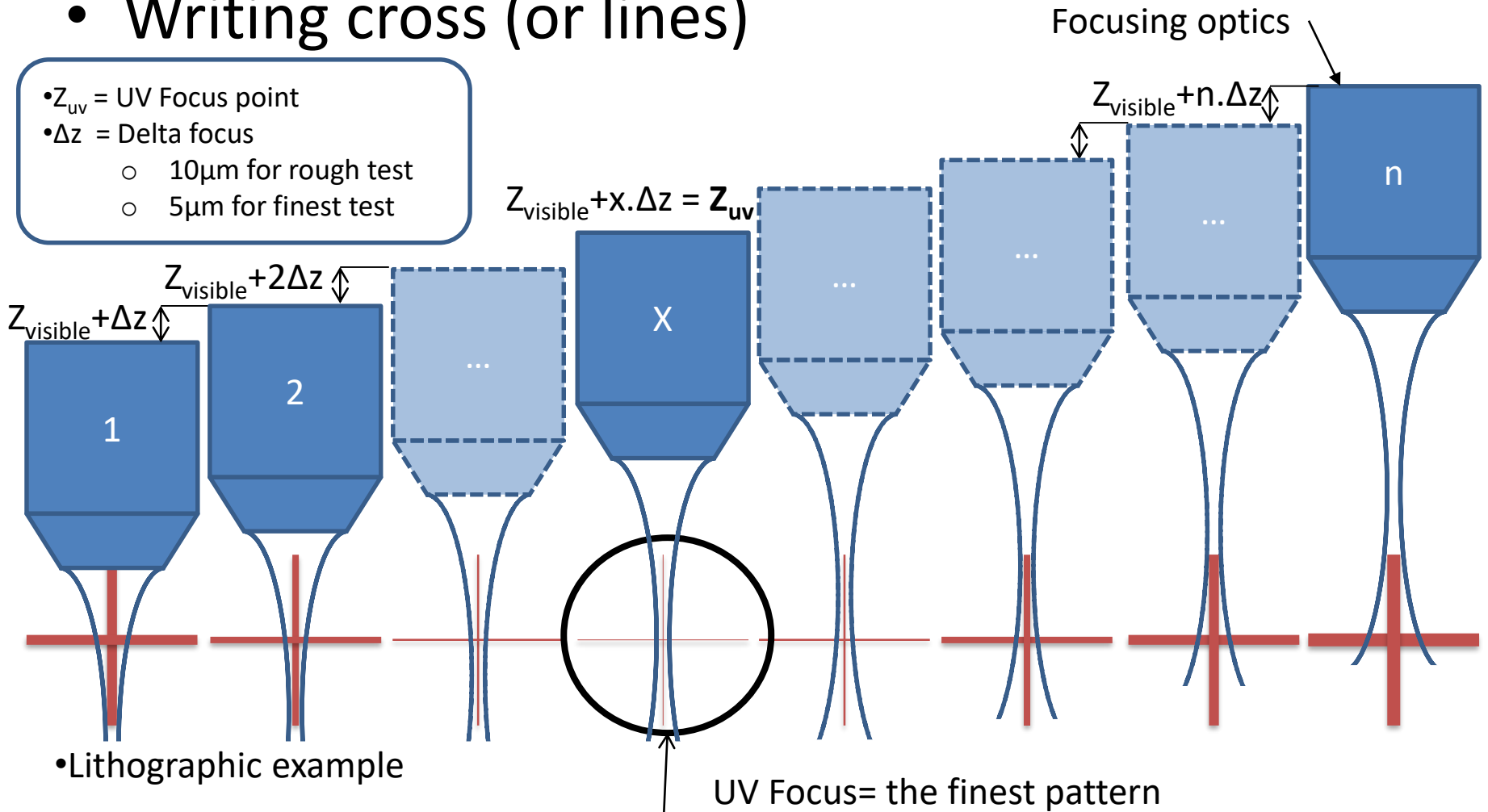
- Finding the UV-Focus



Setting of the focusing height

- Writing cross (or lines)

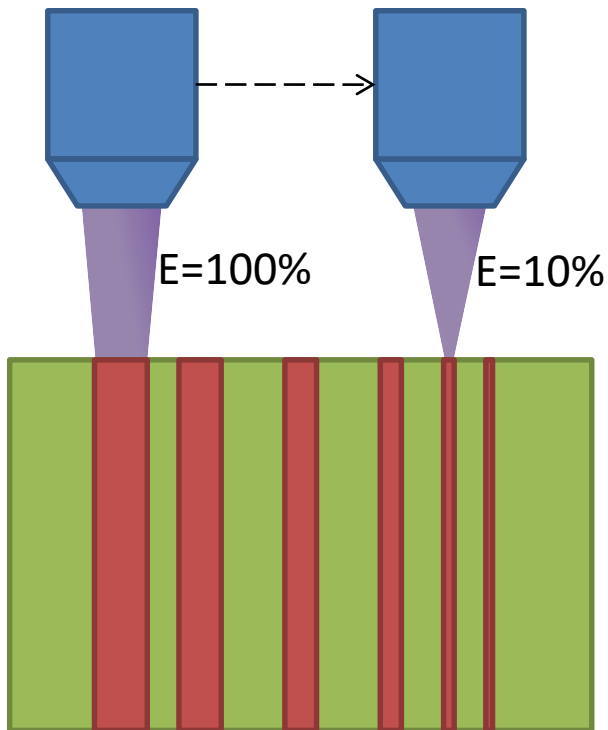
- Z_{uv} = UV Focus point
- Δz = Delta focus
 - 10 μm for rough test
 - 5 μm for finest test



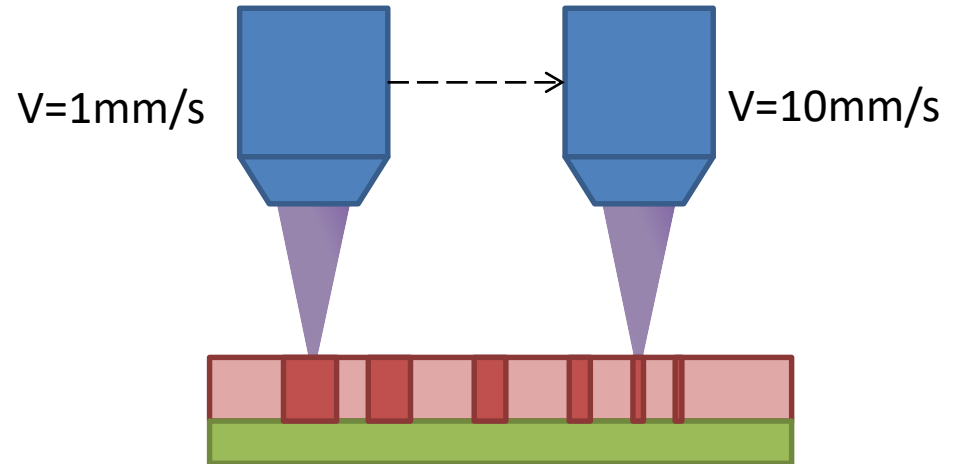
Setting Energy/speed

- Writing lines

Variable energy (%) at V constant



Variables speed (mm/s) at E constant



Sample test to be performed (materials dependant)

V(mm/s)\E (%)	100	80	60	40	20	10	1
0.1							
1							
10							
20							
50							

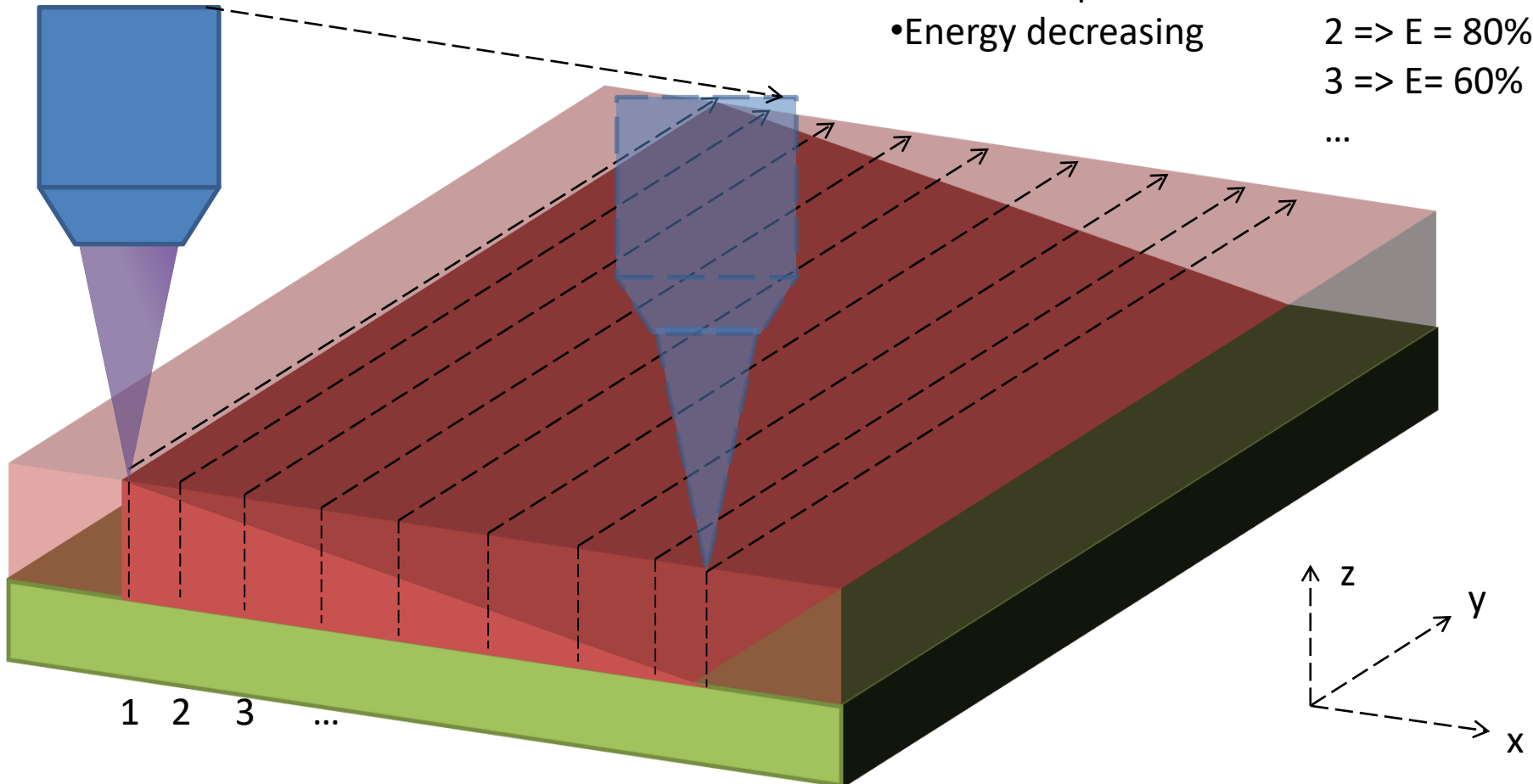
The table is annotated with a green oval labeled 'Over exposed' in the top-left quadrant (low speed, high energy), a blue box labeled 'Optimum' in the center, and a green oval labeled 'Under exposed' in the bottom-right quadrant (high speed, low energy). Red arrows point from the 'Optimum' box towards the 'Over exposed' and 'Under exposed' regions.

GrayScale

- Slope Writing

- Constant speed
- Energy decreasing

1 => E=100%
2 => E = 80%
3 => E= 60%
...



Questions?

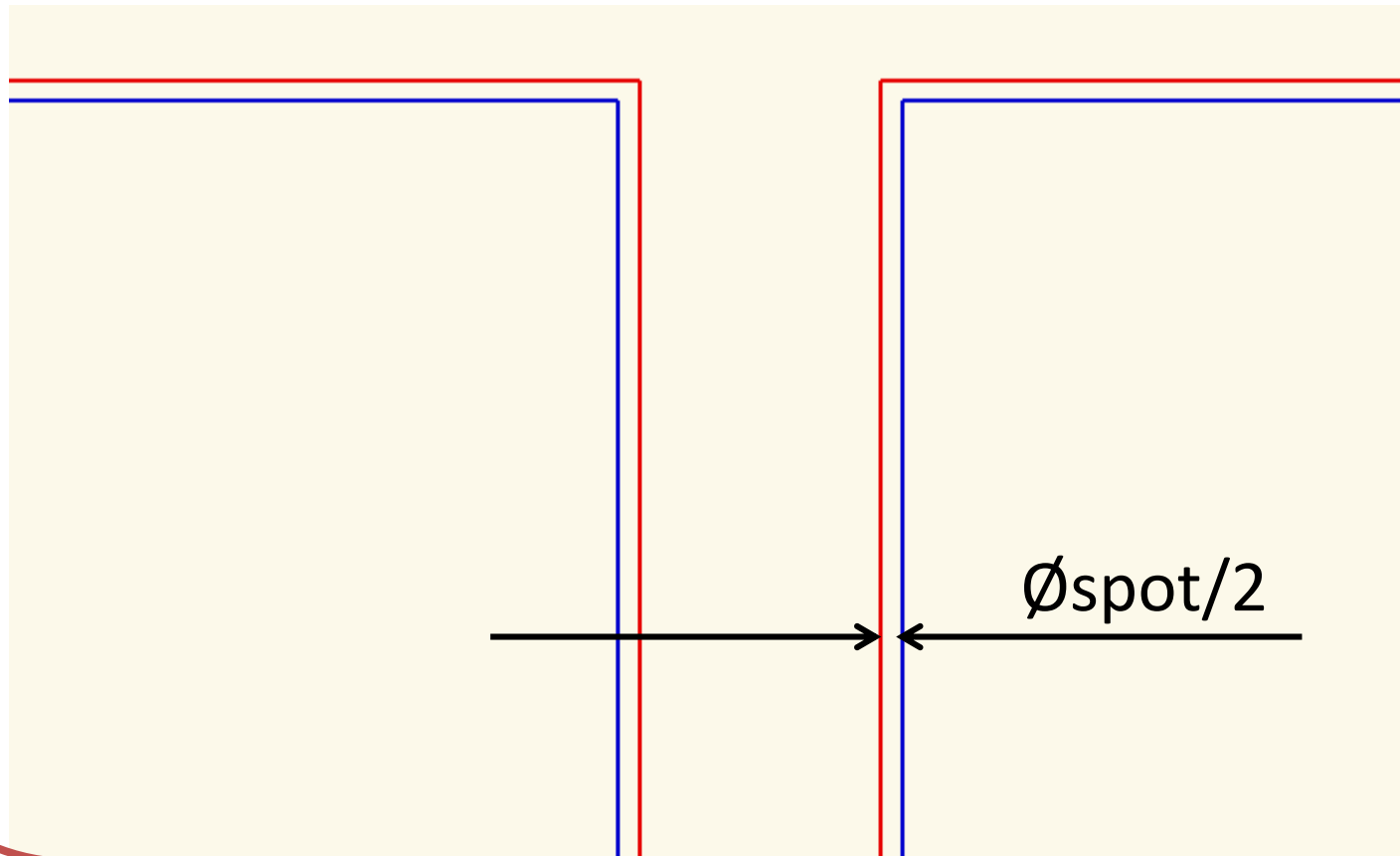


ANNEXE

- Circuit design
 - Spot size consideration

Circuit conception

- Take into consideration the laser spot size



Circuit conception

- Simulation result.

