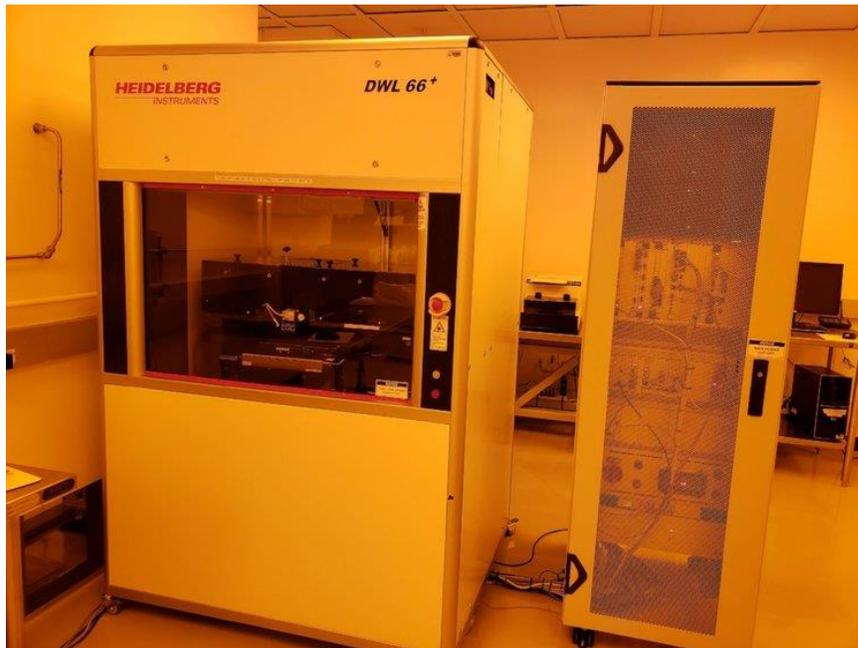


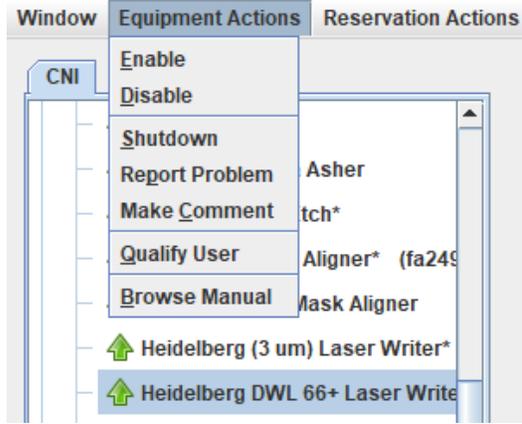
HEIDELBERG DWL 66⁺ LASER WRITER Standard Operating Procedure



These instructions are intended for reference only, and will *not* replace the thorough training required for proper system operation. Contact a clean room staff member with questions or to report a system problem.

Written by Gaurang Bhatt. Edited by Dr. Jaeun Yu and Dr. Nava Ariel-Sternberg

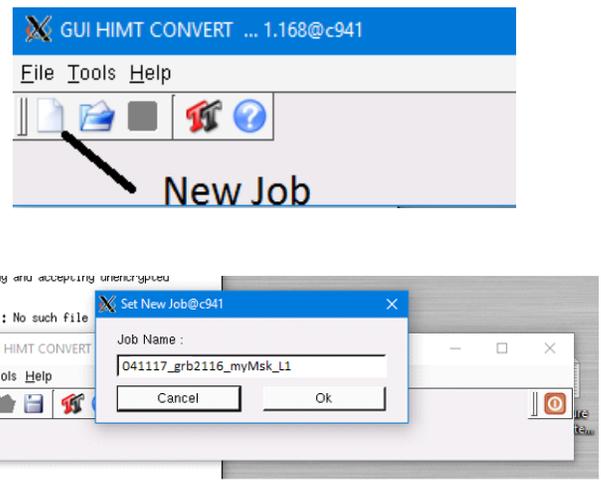


<p>1. BADGER: Enable the tool in badger.</p>	
<p>2. FILE TRANSFER: The system accepts the following file types for your mask design: DXF, CIF, GDSII, and Gerber files.</p> <p>You need to copy your files to the computer of the system. Use the USB port on the left monitor to connect a USB drive (Or use the USB port of the lower PC).</p> <p>Copy your files to: /home/convert/File type. (e.g.: /home/convert/CIF).</p> <p>To access the folder, double click on the icon “convert (172.18.41.201)” on the desktop.</p>	
<p>3. CONVERSION: Double click on the “APP” icon on the desktop.</p>	



Click on “new job” icon.
 Enter a job name by the convention of the lab:
MMDDYY_UNI_MaskName_Layer Name.

The file name should be up to 26 characters and should not include whitespace. Other job formats will be deleted. Jobs older than a month will be periodically deleted to free up disk space. Do not save your files anywhere else on the computer.



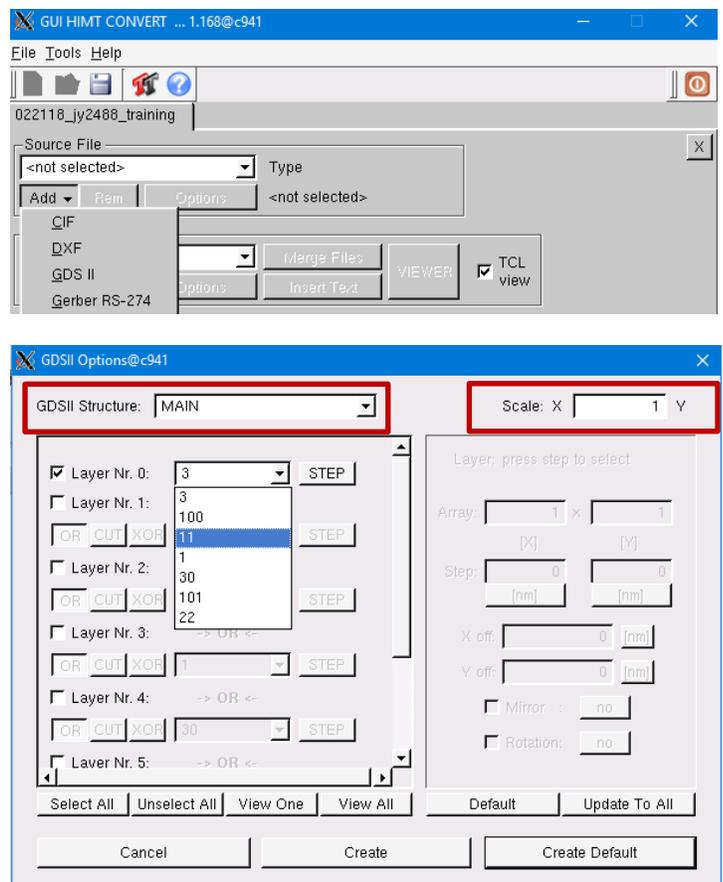
Job Name:
MMDDYY_UNI_MaskName_LayerName

4. CONVERSION cont.:
 From the “Add” icon drop-down menu choose the format of your file.

A new window will open. Make sure to select the right parameters.

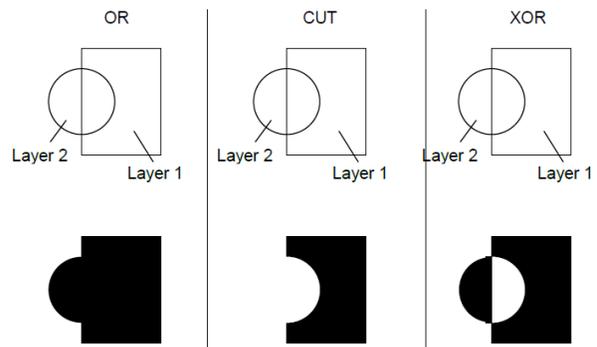
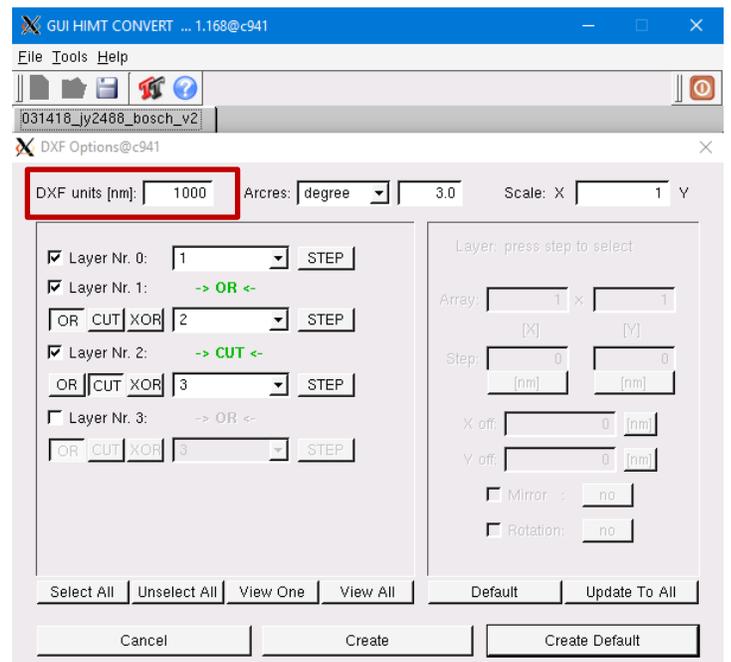
Review the scale on the top right corner of the window to make sure it’s correct for your design (Generally X: 1 Y by default).

For **GDS II**, “GDSII Structure” is the cell you want to write. It’s typically the highest cell in your CAD hierarchy.




For **DXF**, type the DXF units in nm (e.g., enter 1000 if μm is your unit on the design).

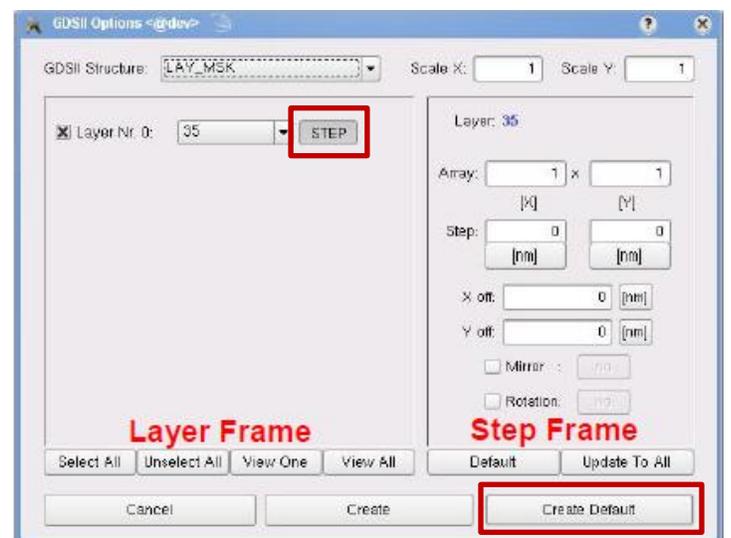
Unclick all the layers, and then choose the layer you wish to write. Alternatively, you can select several layers in parallel and use the functions (OR, CUT, XOR). These functions can allow you to merge layers by using a combined pattern from two layers (OR) or removing the overlapping parts in one or both layers (CUT and XOR).

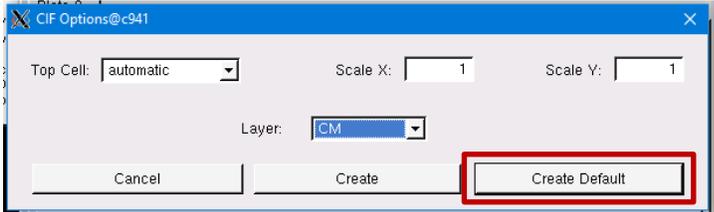


5. CONVERSION Cont:

To mirror, rotate, or shift the layer, press on "STEP". The window to the right will become available.

You can set an array by entering the number of columns (X) and rows (Y), and then set the distances in both directions for the step and repeat function.



<p>X off and Y off are shifts of the layer. You can change the units by clicking on them.</p> <p>Mirror can be added by checking it, and then choose the axis (by X or by Y). Rotation can be checked for 90, 180, and 270 degrees clockwise rotation.</p> <p>For CIF, set to “automatic”. The highest number in the list will be used as the top cell. Select the Layer you want to write.</p> <p>When you are done, click on “Create Default” to store the configuration into the configuration file.</p>	
<p>6. REVIEW DESIGN:</p> <p>Unclick TCL view and click on “VIEWER” to review your design.</p> <p>The Expose Window tab shows the size of the current expose window (can be adjusted). You can type in new numbers or use the +/- to adjust the window size. You can use “Reset” to return to the original values. Units can be changed by clicking on them (mm/nm/μm).</p>	

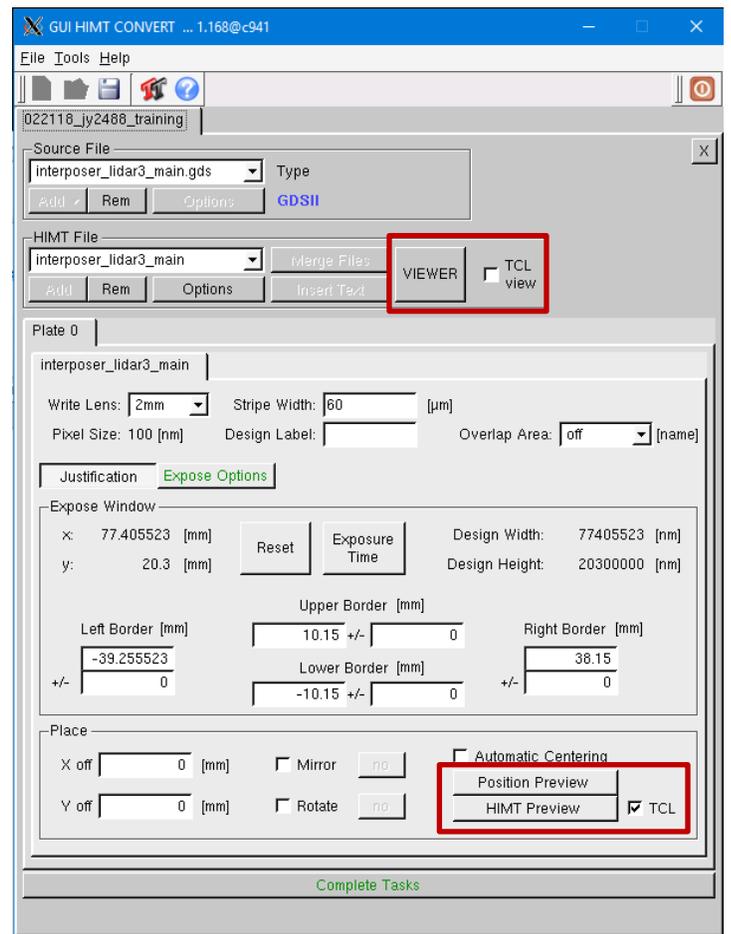


At the Place tab choose the required X and Y offset, rotation angle, and mirroring if you need them for your design adjustment. To switch between mirror at X or Y click on them.

If “Automatic Centering” is checked, the design origin will be the center of the exposed window.

Click on “Position Preview” to view design placement on the plate. If there is an offset, it will appear as a red box.

Do not change any other parameters in Plate 0.

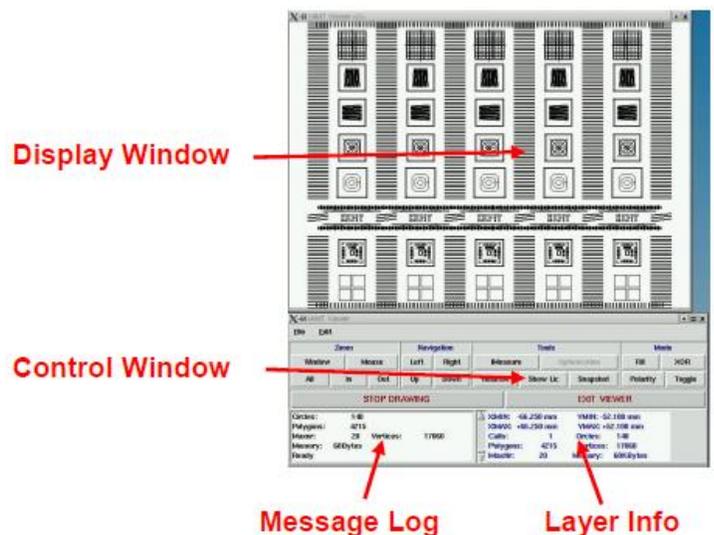


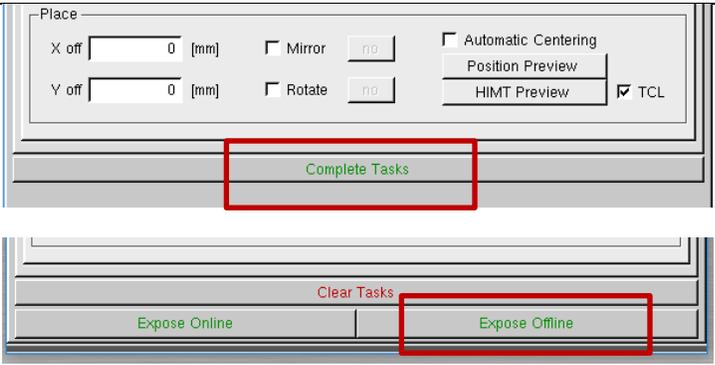
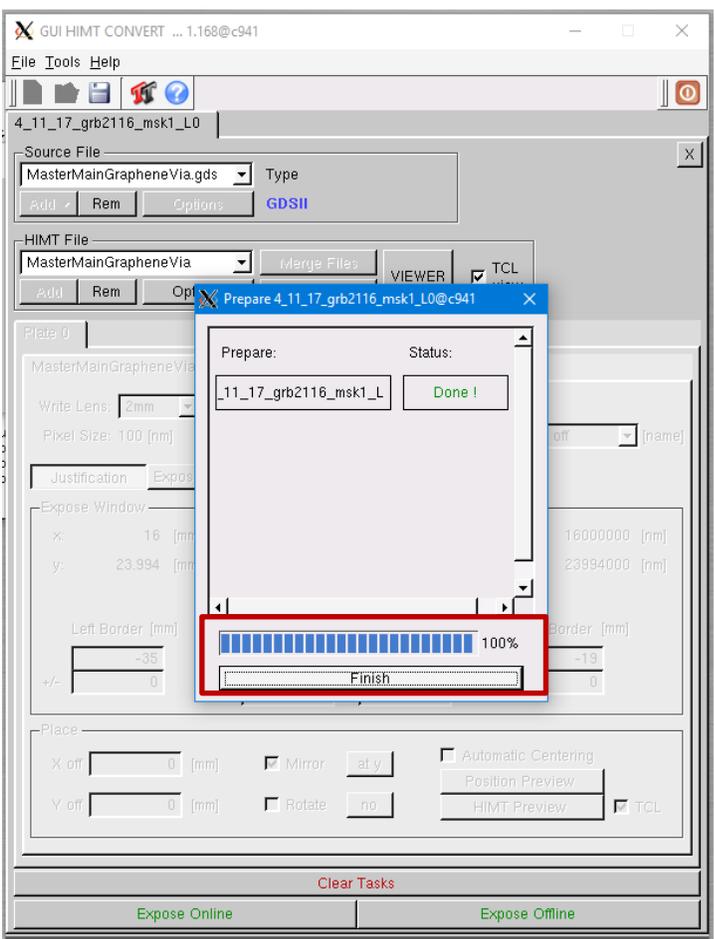
7. HIMT VIEWER:

To view your final and modified design unclick TCL in the Place tab and then click on “HIMT preview”.

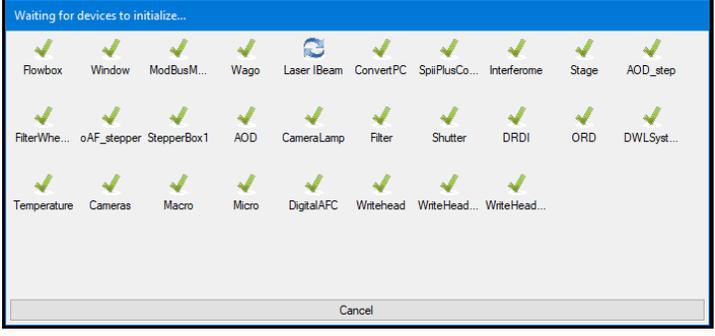
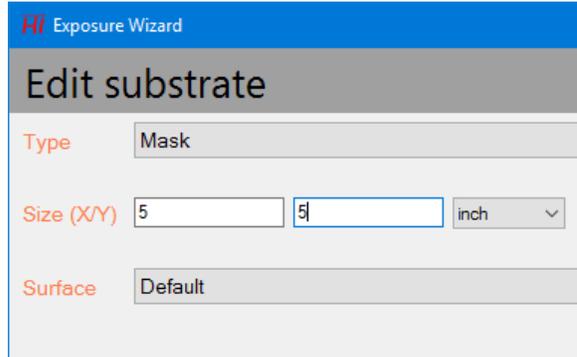
Once you open your design in HIMT viewer, you will see two windows: Control Window and Display Window.

In the Control Window, you can see the messages on the progress of the task and the Layer box provides info on the design layers.



	<p>Click on “Exit Viewer” button to close the HIMT viewer.</p>
<p>8. COMPLETE TASK AND SAVE: After done click on “Complete Tasks” and then save the file with a .job extension. Do not change the file name. The write time in the pop-up window is not accurate.</p> <p>Then, click “Expose Offline” to transfer the file to Laser Internal Code =LIC format accepted by the machine. Wait for the transfer to complete, and then, click on “Finish”.</p> <p>Close the conversion window and the APP software.</p>	 
<p>9. VERIFY SYSTEM STATUS: Make sure the window of a flow box is closed. Open the Lithography Menu software.</p>	



<p>Log-in as basic or user accounts</p> <p>Monitor for all the indicators in the pop-up window to show green. If there is any issue, please report to the superusers or cleanroom staff.</p>	
<p>10. EXPOSURE WIZARD:</p> <p>For a basic mode, the “Exposure Wizard” window will be open. If it doesn’t show automatically, go to Wizardry>Exposure Wizard.</p>	
<p>11. EDIT SUBSTRATE:</p> <p>Choose your substrate type from the drop-down menu.</p> <p>If you are doing a direct write on a substrate other than a standard mask plate, choose the type as a mask if the substrate is rectangular.</p> <p>Chose 4” wafer only if you are writing on a full wafer. The tool will automatically align the design (write direction) to the primary flat of the wafer.</p> <p>Click Next step.</p>	
<p>12. DESIGN SELECTION:</p> <p>Find your converted design from the list in the left half of the</p>	

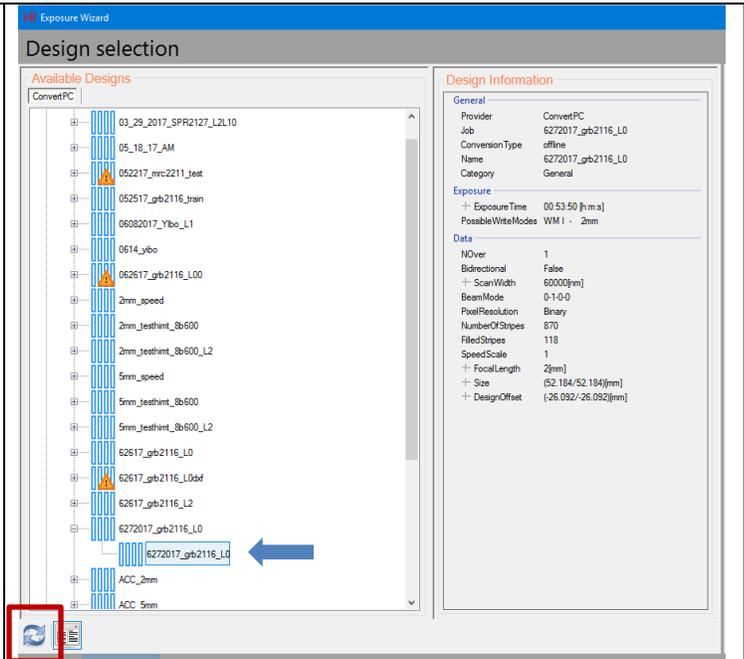


window. Click on the '+' icon next to your design and choose the design file nested under.

Click refresh icon on the left bottom corner if you can't find your design.

Once the design is chosen, refer the right side of the window for writing time information.

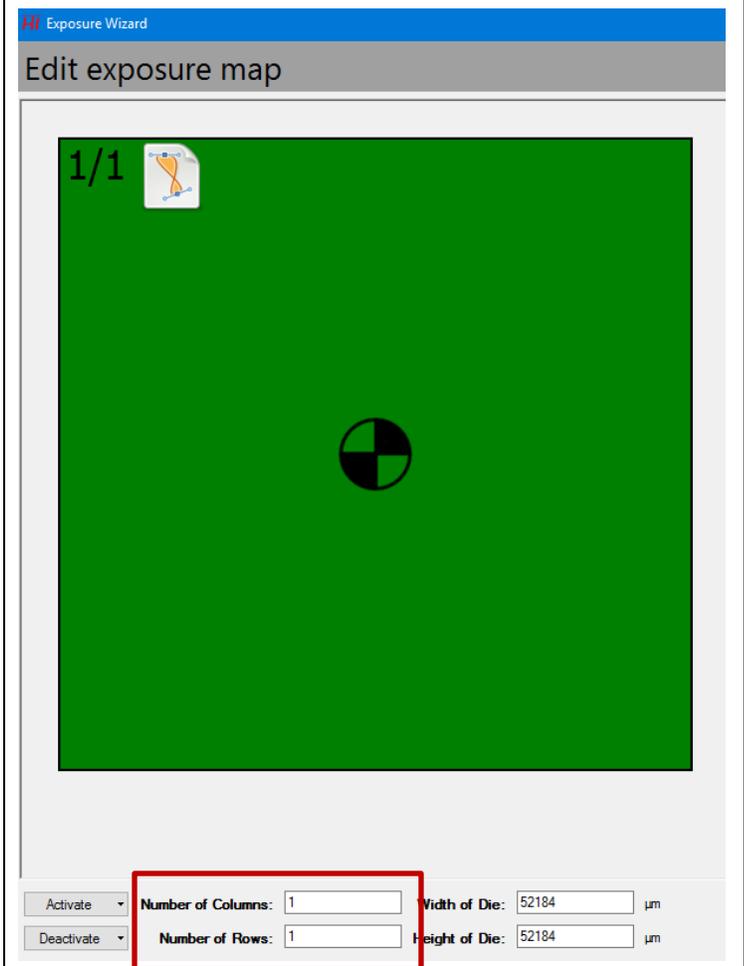
Click Next step.



13. EDIT EXPOSURE MAP:

The width and height of the write area will be automatically populated. The wizard will show the standard one-field map.

The cross  represents the stage coordinate origin. It can be modified via drag-and-drop into other possible positions.

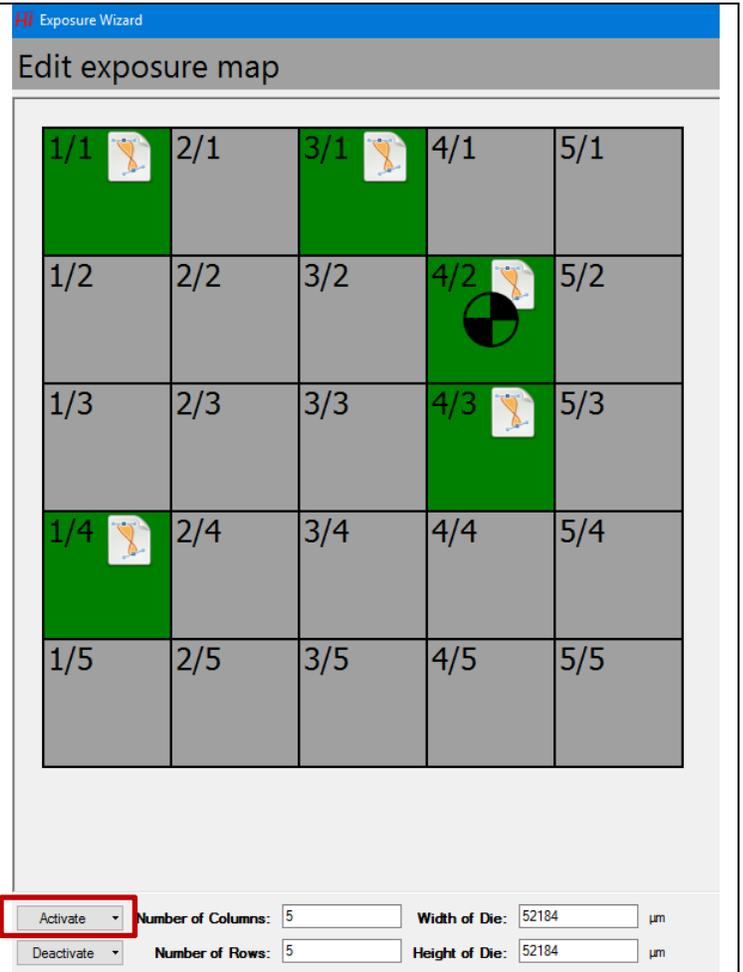


If you want to repeat the design in a grid fashion on the substrate, use the column/row numbers.

Make sure to click “Activate” for each of the grid cells. If the grid cell is Green, it is activated to write. If it is Grey, it is disabled and will not be written.

Move the cross  to the desired position.

Click Next step.



14. PARAMETER SETUP:

Enter the Dose parameters. The parameters for the regular mask with S1800 resist is available on the desktop note. Please check the most updated parameters.

Enter Laser Power:

Intensity:

Filter:

Focus: Pneumatic or Optical

Offset (-100..100%):

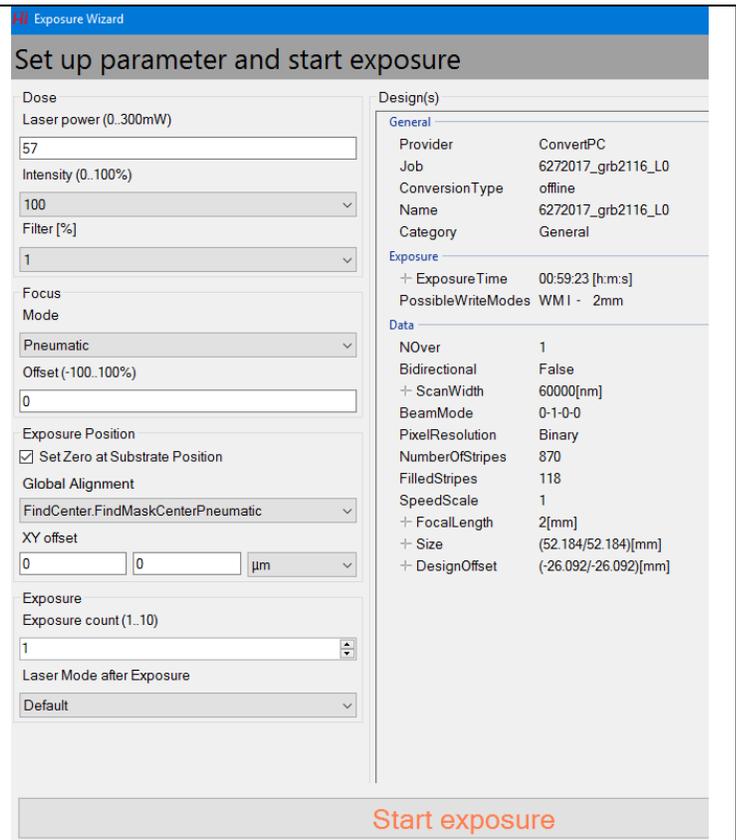


Choose the focus mode as Optical for the finer resolution.

For Global Alignment method, choose one of the following as per your write requirements.

FindCenter.FindMaskCenterPneumatic
 FindCenter.FindMaskCenterOptical
 FindCenter.FindWaferCenterPneumatic
 FindCenter.FindWaferCenterOptical

FindWaferCenterOptical and FindWaferCenterPneumatic are for 4" wafers. If you are using rectangular wafer chips, they are considered as a mask for the alignment algorithm.



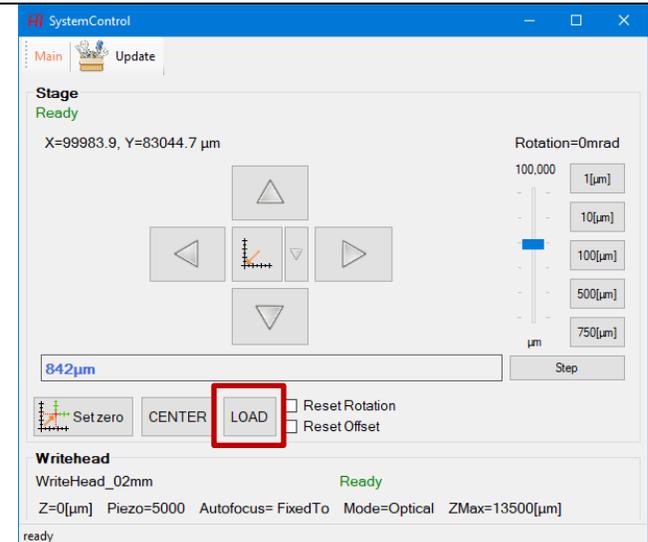
15. SUBSTRATE LOADING:

Ensure that the stage is in the load position (see the picture on the next page). The write head will be at the left back corner of the stage.

If the stage is not at the load position, open the stage control window:

Controls>SystemControl.
 Then, Click "LOAD".

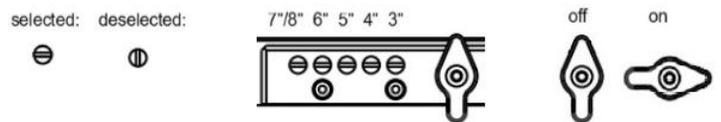
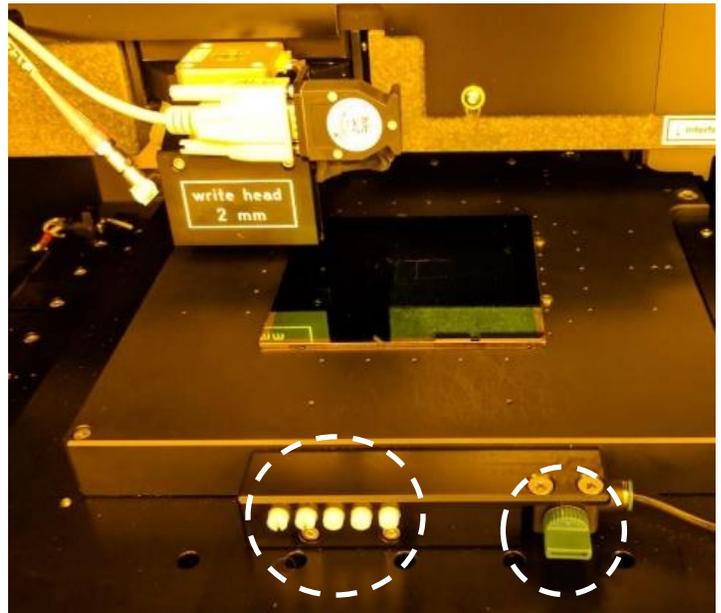
Press the red button on the tool side to open the flow box window.



Choose the front five white screws to select the vacuum for the appropriate size of the substrate. From Left-to-Right the screws are for 7", 6", 5", 4" and 3" substrate size.

While placing the substrate, ensure not to hit the write head and the side mirrors on the stage. Avoid putting weight or force on the stage while loading the substrate.

Once the substrate is placed turn the green master vacuum switch on to enable vacuum. Turn horizontal for "on" and vertical for "off".

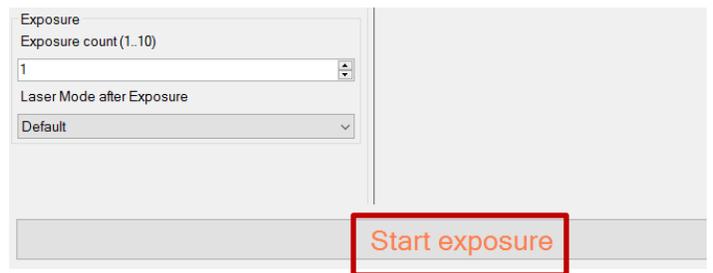


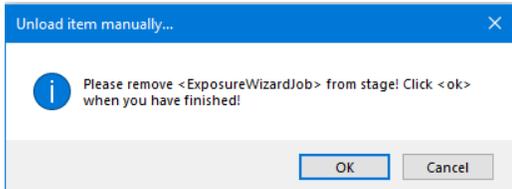
16. EXPOSURE:

Click on "Start Exposure" to begin the exposure.

The pop-up message will say "Write Head is NOT focused! Do this right now or cancel processing item?" Click "Yes".

Then, the write head will be focused on the substrate, and FindCenter will be executed.



	<p>Wait until another pop-up message asking if you want to start the laser for writing. Click “Yes”.</p> <p>The exposure will start. The progress of the exposure is shown in the wizard.</p> <p>The exposure can be stopped at any time by clicking on “Stop exposure”.</p>	
<p>17. UNLOADING:</p>	<p>Once the writing is over the stage will automatically move to the load position.</p> <p>Open the flow box window. Turn off the vacuum switch and remove the mask. Close the flow box window.</p> <p>Turn off the software.</p>	
<p>18. BADGER LOGOUT:</p>	<p>Don't forget to disable the tool in badger after you're done.</p>	