

HEIDELBERG DWL 2000 LASER WRITER

CORNELL NANOSCALE FACILITY

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The Heidelberg Instruments DWL 2000 is an economical, high resolution direct write pattern generator for direct writing on photosensitive Cr mask plates. At CNF, the DWL 2000 accepts photomask plates up to 0.250" thick and up to 9" in size. The unit has interchangeable write heads that accommodate writing different feature sizes. The smallest feature size is 0.8 microns and 0.6 microns with the 4mm and 2mm write heads, respectively.

DWL 2000 system consists of the main system unit, an XP-based PC for running job files, a Linux based PC for data conversion, and a pattern generator (located in the service area). The tool accepts files of various formats; for best results we recommend the semiconductor standard GDSII format.

GUIDELINES:

- 1.** PHOTOMASKS ONLY! NO wafers.
- 2.** Changing to a 2mm write head: Email manager and backup one week in advance to request changeover to the 2mm write head. Changeover will be based on staff availability and will not occur on Friday or weekends. Changeover will be for overnight writes. Staff time and additional tool time will be applied to the user account.
- 3.** 4mm write head – 0.8 micron nominal resolution at 100mm²/min
- 4.** 2mm write head – 0.6 micron nominal resolution at 29mm²/min

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0. Quick Guide: DWL 2000 Mask Making

1. Transfer GDSII files via CNF Lab Transfer Share into the gdsii directory
2. Use the frame generator to create a barcode (for the steppers) or label (for contact)
3. Using the X-Convert DWL 2000 conversion program, read in your GDSII pattern file
4. Using the X-Convert DWL 2000 conversion program, read in your GDSII frame file
5. Merge the two files, delete existing Plate 0, then add the merged plate
6. Choose the correct write head, mirror the data (don't mirror backside exposure masks)
7. Create a job file – use the Offline mode except for very small files
8. Turn laser ON
9. Load mask using the L-shaped mask guide
10. Remove the mask guide, close the door
11. Load job file in the job template
12. Check the Auto Unload and Laser Shutdown options
13. Center the stage, focus, find center of the plate, Expose
14. Unload mask when exposure finishes, close the DWL 2000 door
- 15. Make sure that the LASER is OFF when finished – LOG OUT**
16. Develop and etch Cr using the Hamatech, then strip resist

1. Pattern Conversion

CAD GUIDELINES:

1. Use only GDSII files with NO MORE THAN 199 POINTS PER POLYGON
2. ORIGIN of CAD pattern corresponds to the CENTER of the mask
3. CAD feature dimensions should represent feature dimensions on the wafer – use the XConvert software for scaling stepper masks
4. Drawn Layer objects represent removed Cr
5. Use LayoutBEAMER to perform CAD layer inversions (for more information see CNF Computing Wiki resources).

TRANSFERRING FILES TO THE LINUX COMPUTER:

Linux conversion computer login and password are **convert**

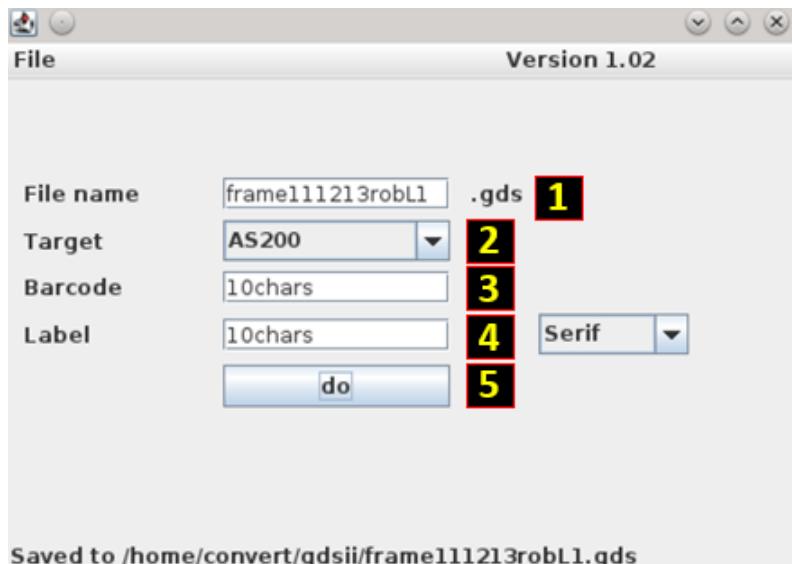
1. Using the CNF windows PCs navigate to the lab transfer share. Place GDSII file in **HeidelbergDWL2000** folder. Alternatively, using CNF Terminals, copy the gds file to **/cnflab/HeidelbergDWL2000**.
2. Using the DWL 2000 convert computer: double click on the **Lab_Transfer_Share** desktop icon.
3. Right click on the file you wish to transfer
4. Choose **Copy To** then click on **Home Folder** then **gdsii** then **Copy Here**

1.1 GCA AS200 & 5X STEPPER PATTERN CONVERSION

1.1.1 GCA Stepper Frame Generation

Frame Generator will create a GDSII file that will have reticle alignment marks for both the AS200 i-line and the 5X g-line steppers. The following marks are generated: RMS, Insitu, barcode, label, and 5X reticle marks.

Using the Linux conversion computer double click on the Frame Generator icon.



1. File name field will already contain the string "frame". You must use the following naming convention: **frameTodaysDateNameLX** where X represents the photolithography layer number. For instance, frame111213robL1 would represent that the frame data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID). **DON'T USE** spaces, special characters, etc.
2. **AS200** is the default "Target" setting and is correct for both of the **GCA Stepper** templates
3. Input a barcode – 10 Characters maximum – Use only letters and numbers
4. Input a mask label – 10 Characters maximum – Use only letters and numbers
5. Click **do**

The frame template file will be saved under the /home/convert/gdsii directory

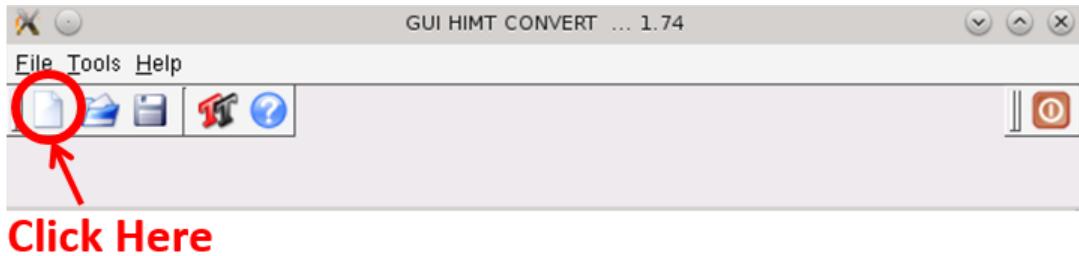
Click **File** Then **Close** to close the Frame Generation application.

1.1.2 GCA Stepper Pattern Conversion



1. To start the pattern conversion software, double click on the X-convert icon.

The **GUI HIMT CONVERT ... 1.74** menu will appear in the following fashion:

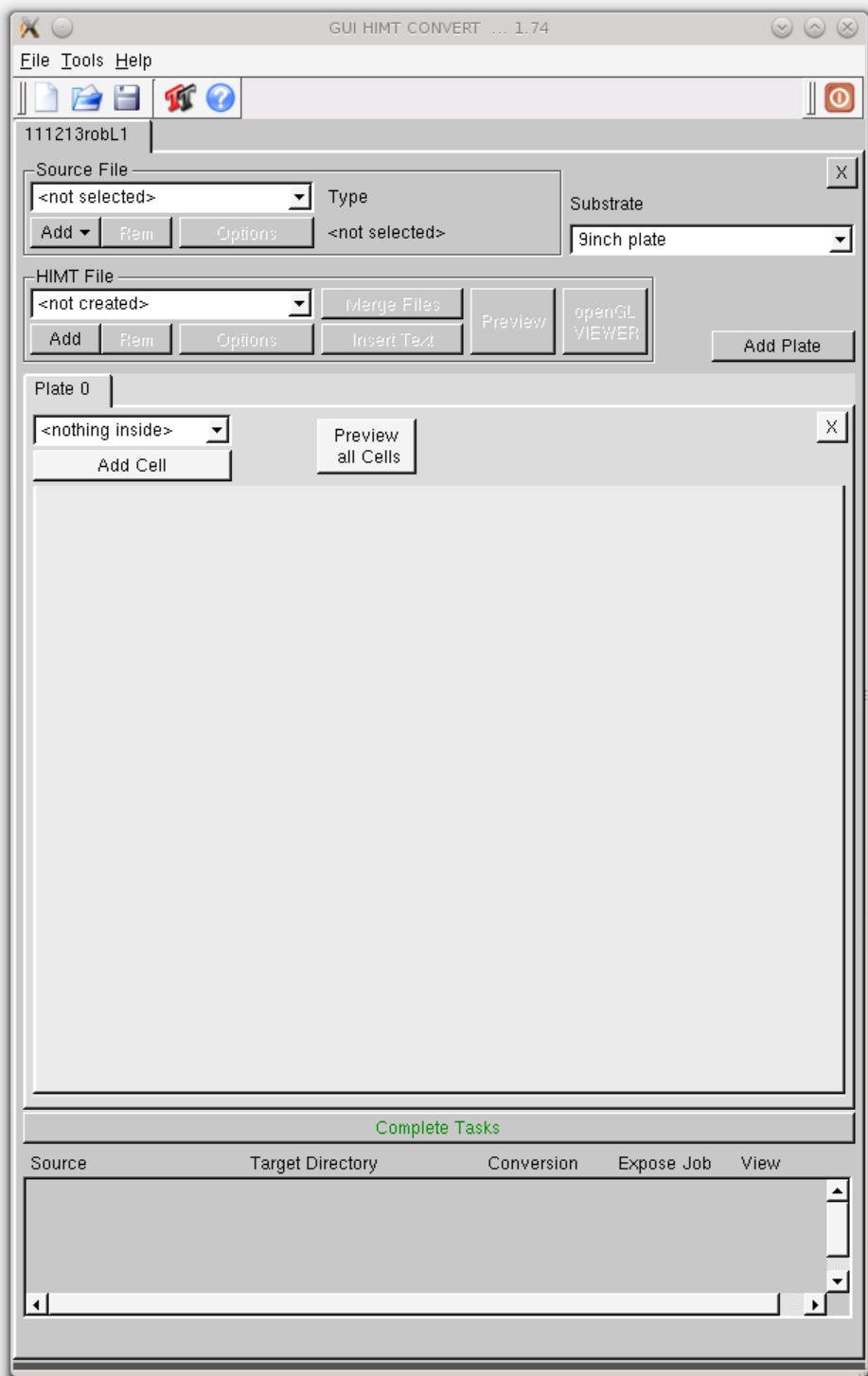


Click on the first icon as schematically illustrated above with an arrow to initiate the conversion sequence.

2. Set New Job window will appear. Within the 'Job Name' field please use the following convention to identify job names: **TodaysDateNameLX** where X represents the photolithography layer number. For instance, 111213robL1 would represent that the pattern data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID).

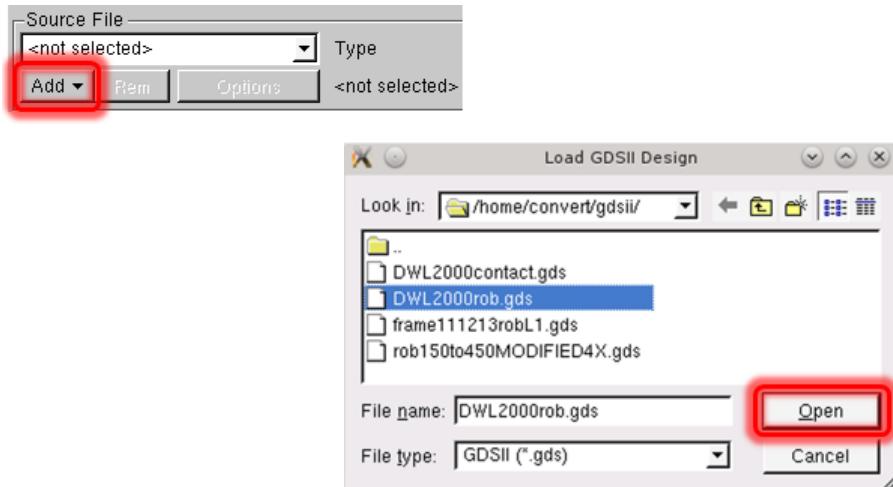


Click **Ok**.

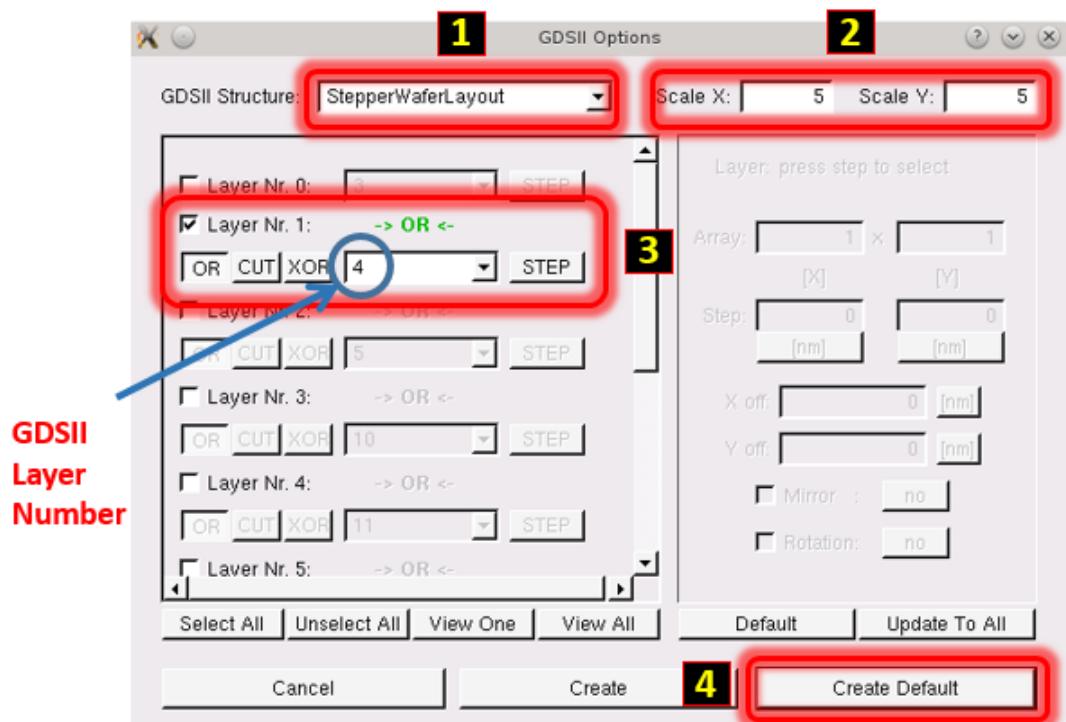


The menu will appear as displayed in the figure above.

3. Click **Add** then **GDSII** within the Source File submenu. **Load GDSII Design** window will appear.

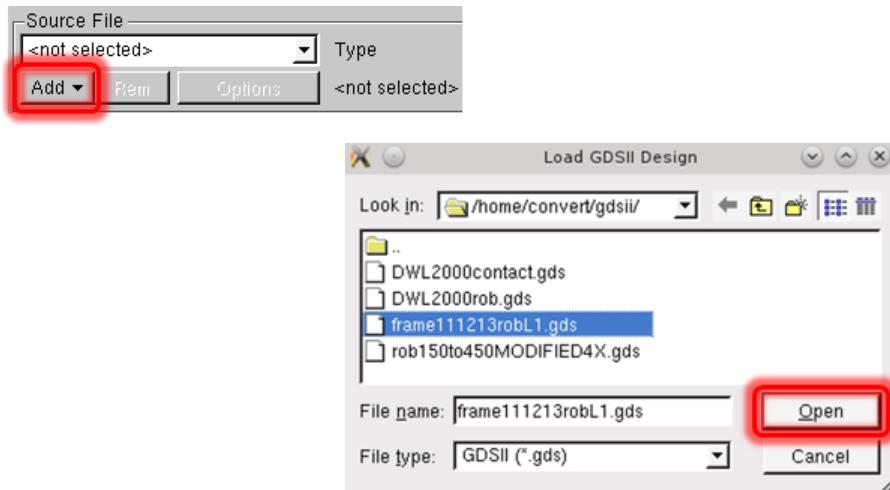


Select your GDSII pattern design file and click **Open**. **GDSII Options** menu will appear.

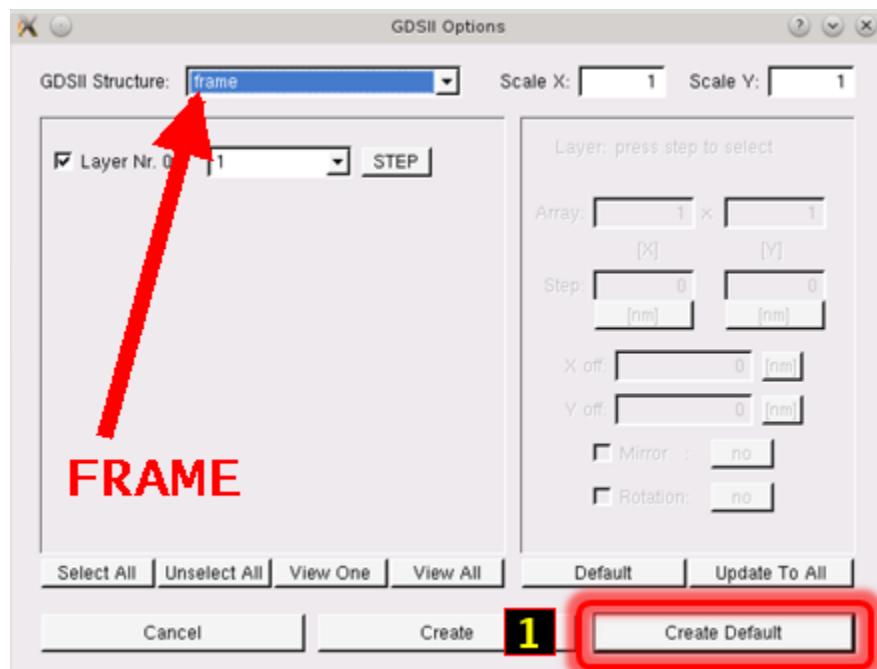


Choose the top-level GDSII Structure (Cell) of your pattern file. Default Scale values for X and Y are 1, and both must be set to 5. Unselect all layers (use the button below the layers – or uncheck manually), then check only the layers you wish to convert. NOTE: Layer Nr. 0, 1, 2, 3, etc. are NOT GDSII layer numbers; GDSII Layer numbers are displayed in the field directly to the left of the STEP button. Click **Create Default**.

4. Click **Add** then **GDSII** within the Source File submenu. **Load GDSII Design** window will appear.

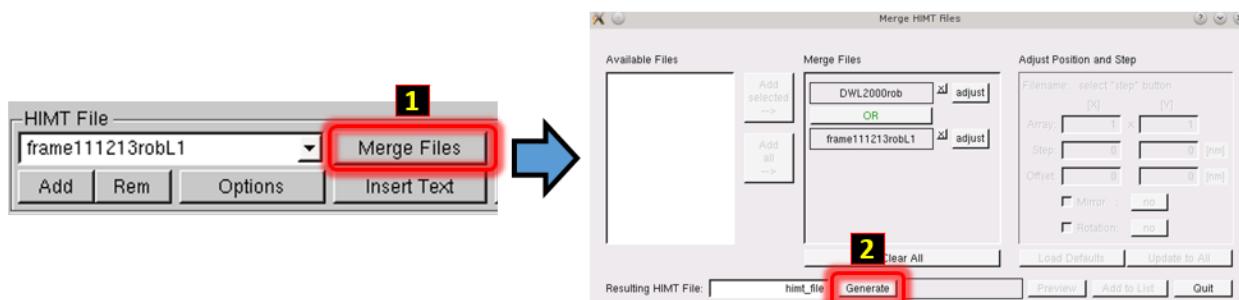


Choose the frame file that you created in the previous section using the Frame Generator. Click **Open**. **GDSII Options** menu will appear.

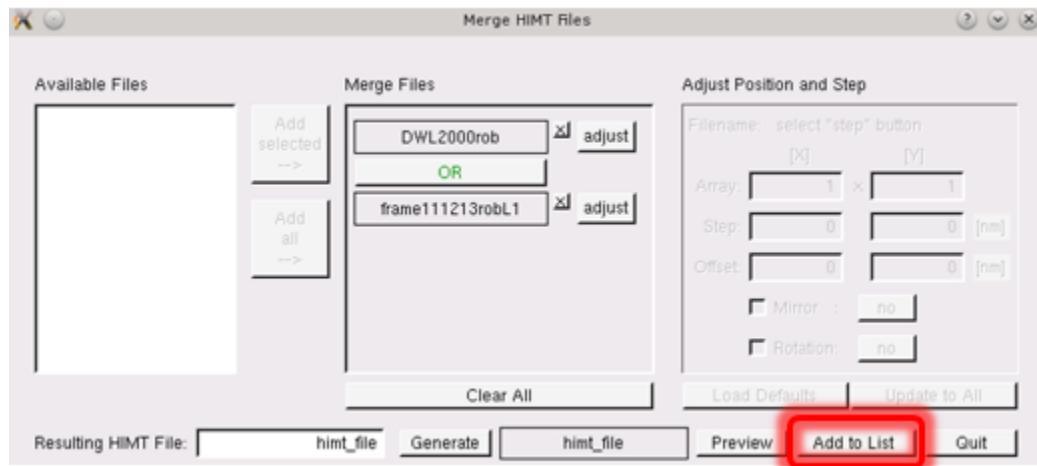


Value for the GDSII structure **MUST** have the value **frame**, the scaling for X and Y must be **1**. Don't change any values. Click **Create Default**.

5. Under "HIMT file" area reside both the pattern as well as the frame files. Click **Merge Files** button, the **Merge HIMT Files** window will appear. Both of the above HIMT files will appear in the **Available Files** portion of the menu. Click the **Add all** button. Both files will appear in the **Merge Files** portion of the menu as displayed below.

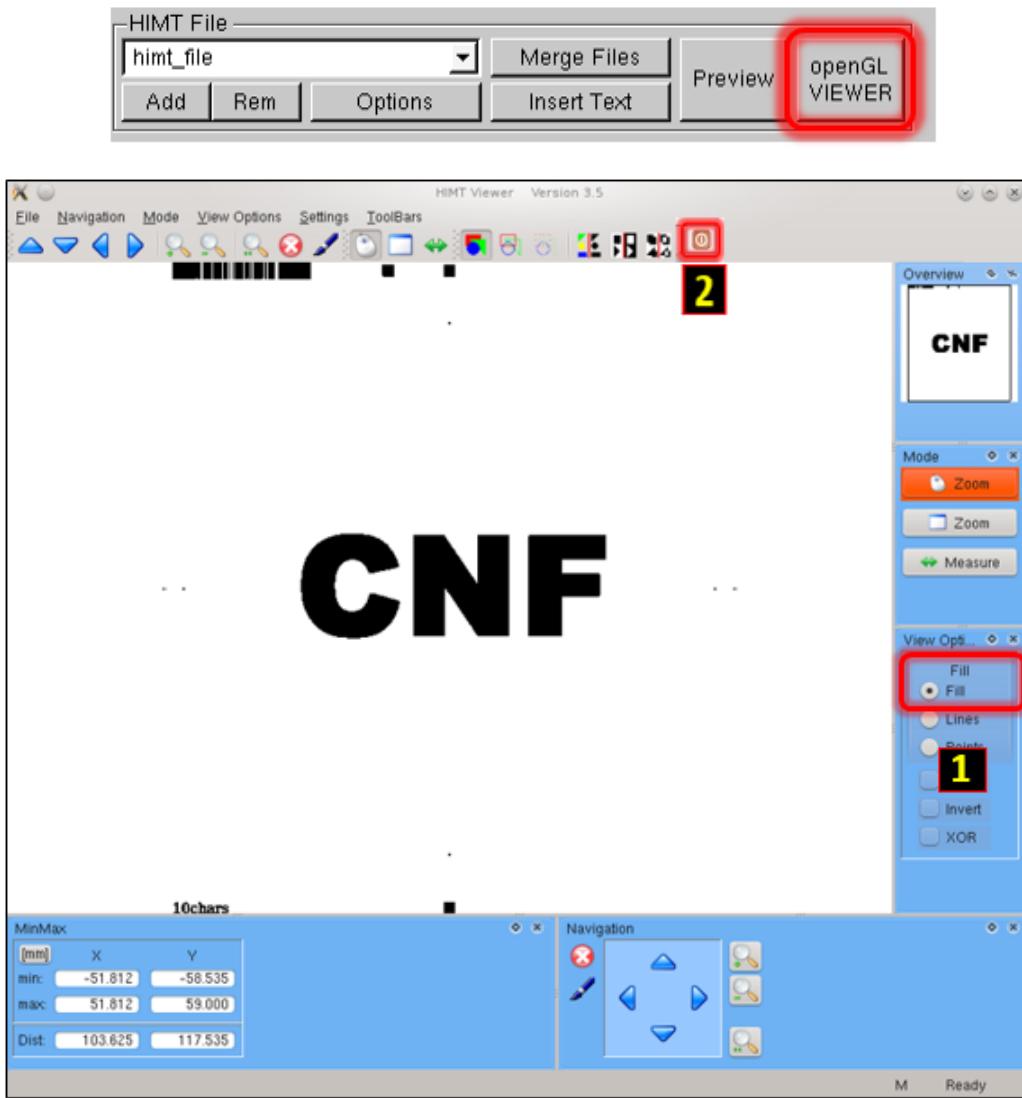


Default value for the generated HIMT file will be called 'himt_file', since we will convert one lithography level at a time this value does not matter. Click **Generate**. Several grayed out buttons to the right of **Generate** will appear active



Click **Add to List** within the **Merge HIMT Files** window. **himt_file** variable will be added to the **HIMT File** menu.

Click **openGL VIEWER** button to view your pattern.

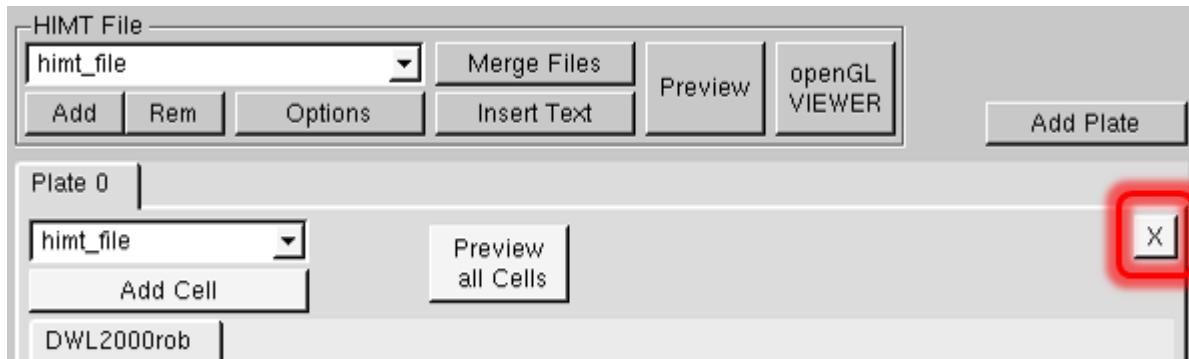


1. Click **Fill** within the viewer option menu. All exposed features will be solid black. Middle click and drag will pan the view, mouse wheel can be used to zoom in and out, etc.

NOTE: The pattern is not mirrored and will be mirrored in a later step. Check the pattern extents (XMIN, XMAX, YMIN and YMAX values directly under the EXIT VIEWER button), as well as details of the pattern.

2. Click the red X button to close the OpenGL Viewer. Closing the window with upper right X will not stop viewer process, just the window, requiring the computer to be rebooted when the number of running viewers bogs down the system.

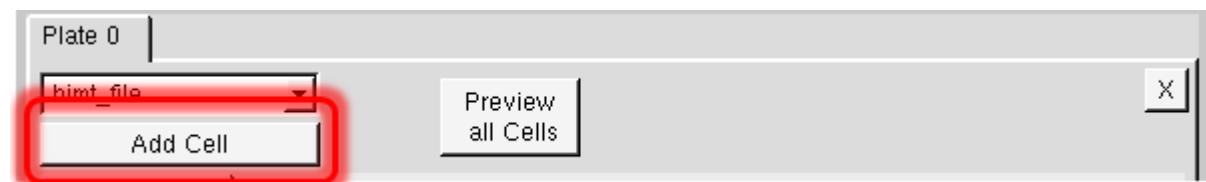
6. Under the **Plate 0** tab, click on the X (circled in red below) to remove the existing tab. The **Plate 0** tab will completely disappear.

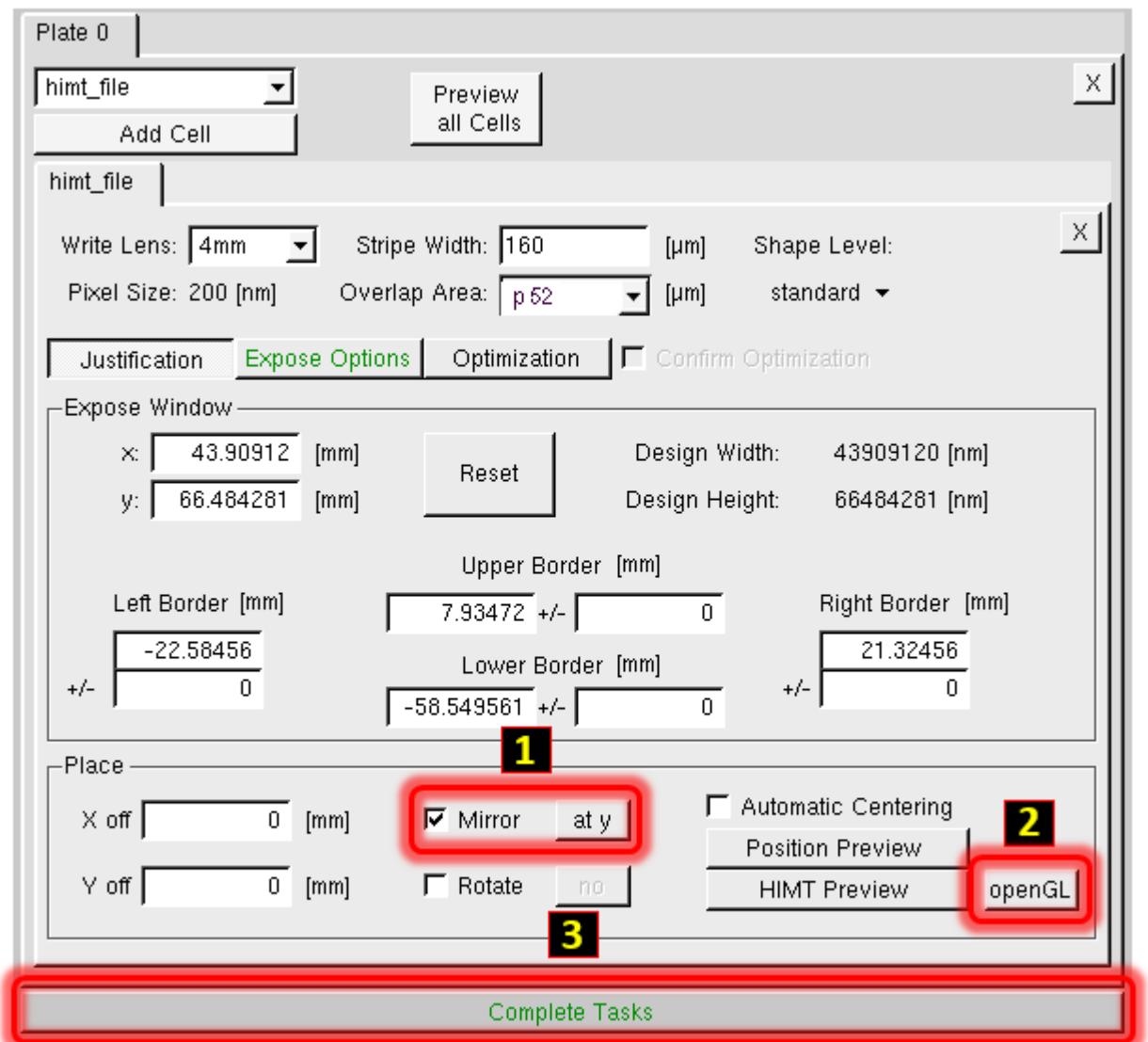


Click **Add Plate**. An empty **Plate 0** tab will appear



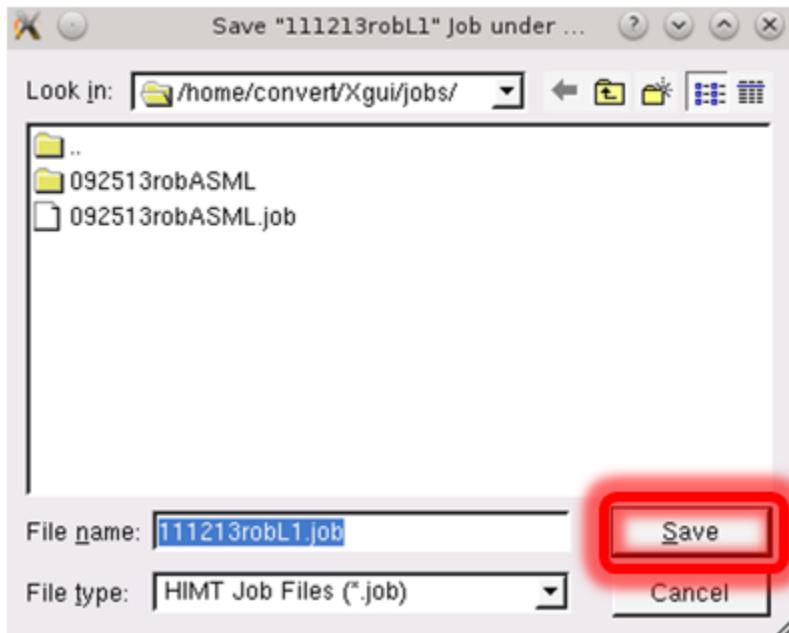
next to the **Add Cell** button. Choose the merged file called **himt_file**, then click **Add Cell** button and the **himt_file** tab will appear under the **Plate 0** tab.



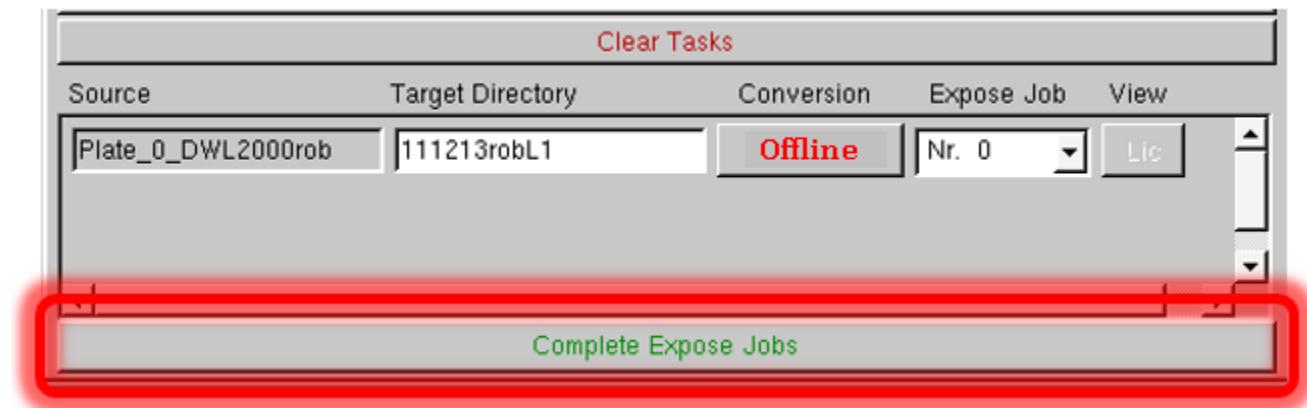


Within Place verify that to the left of **Mirror** the appears within the box. The default value **at y** is the correct value (step 1) EXCEPT for wafer backside exposures; consult Staff if unsure. Clicking on **openGL** (step 2) will allow you to view the data. The data now will appear correctly mirrored. Exit the openGL viewer when finished. Click **Complete Tasks**.

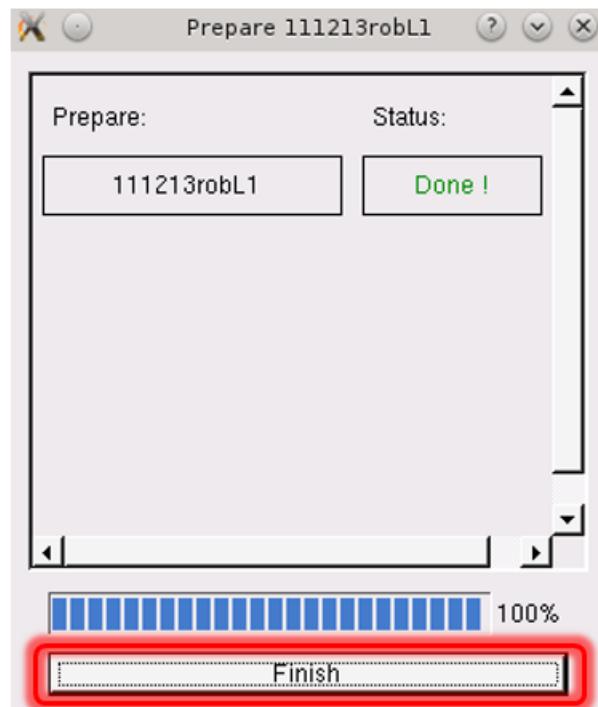
7. Click **Save** to save the job file. Use the same naming convention as described above (TodaysDateNameLX).



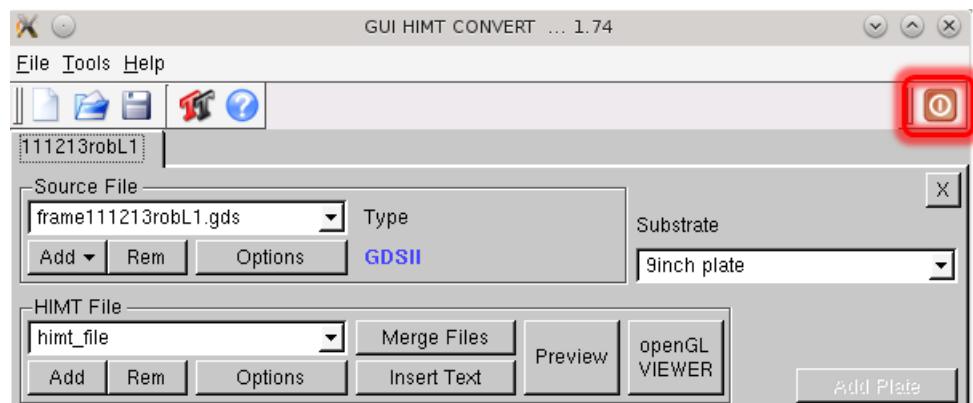
8. Lower portion of the **GUI HIMT CONVERT ... 1.74** menu will appear as in the above figure. Conversions will almost always be done Online. Click **Complete Expose Jobs**. Prepare menu will then appear.



9. Click **Finish** within the **Prepare** window.



10. Close the menu by clicking the highlighted button.

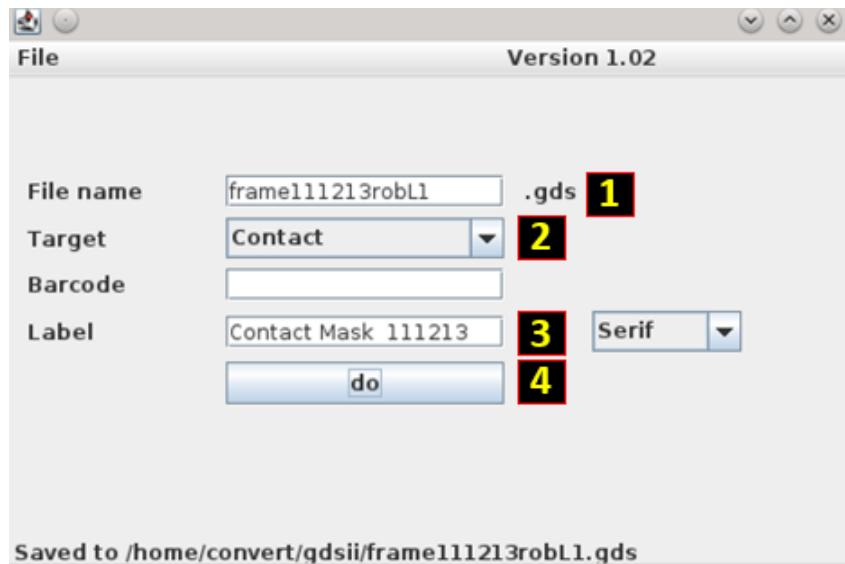


1.2 CONTACT PATTERN CONVERSION – All CNF Contact Aligners

1.2.1 Contact Frame Generation

Frame Generator will create a GDSII file that will have a label at a proper location near the bottom of the reticle. This is valid for all CNF contact aligners.

Using the Linux conversion computer double click on the Frame Generator icon.



1. File name field will already contain the string "frame". You must use the following naming convention: **frameTodaysDateNameX** where X represents the photolithography layer number. For instance, frame111213robL1 would represent that the frame data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID). **DON'T USE** spaces, special characters, etc.
2. **AS200** is the default "Target", set the target to **Contact**.
3. Input a mask label – 20 Characters maximum – Use only letters and numbers
4. Click **do**

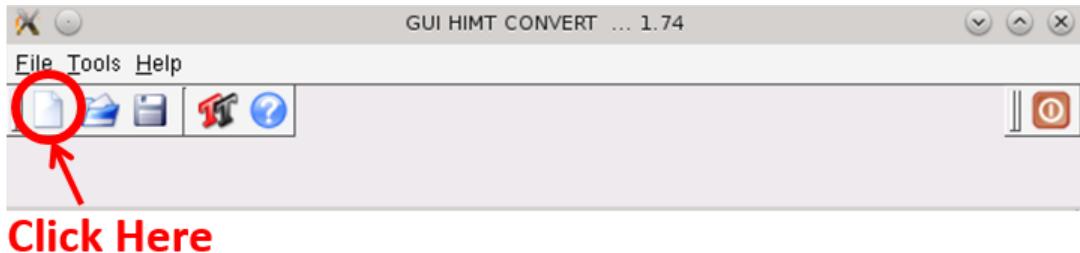
The frame template file will be saved under the /home/convert/gdsii directory

Click **File** Then **Close** to close the Frame Generation application.

1.2.2 Contact Pattern Conversion

1. To start the pattern conversion software, double click on the X-convert icon.

The **GUI HIMT CONVERT ... 1.74** menu will appear in the following fashion:

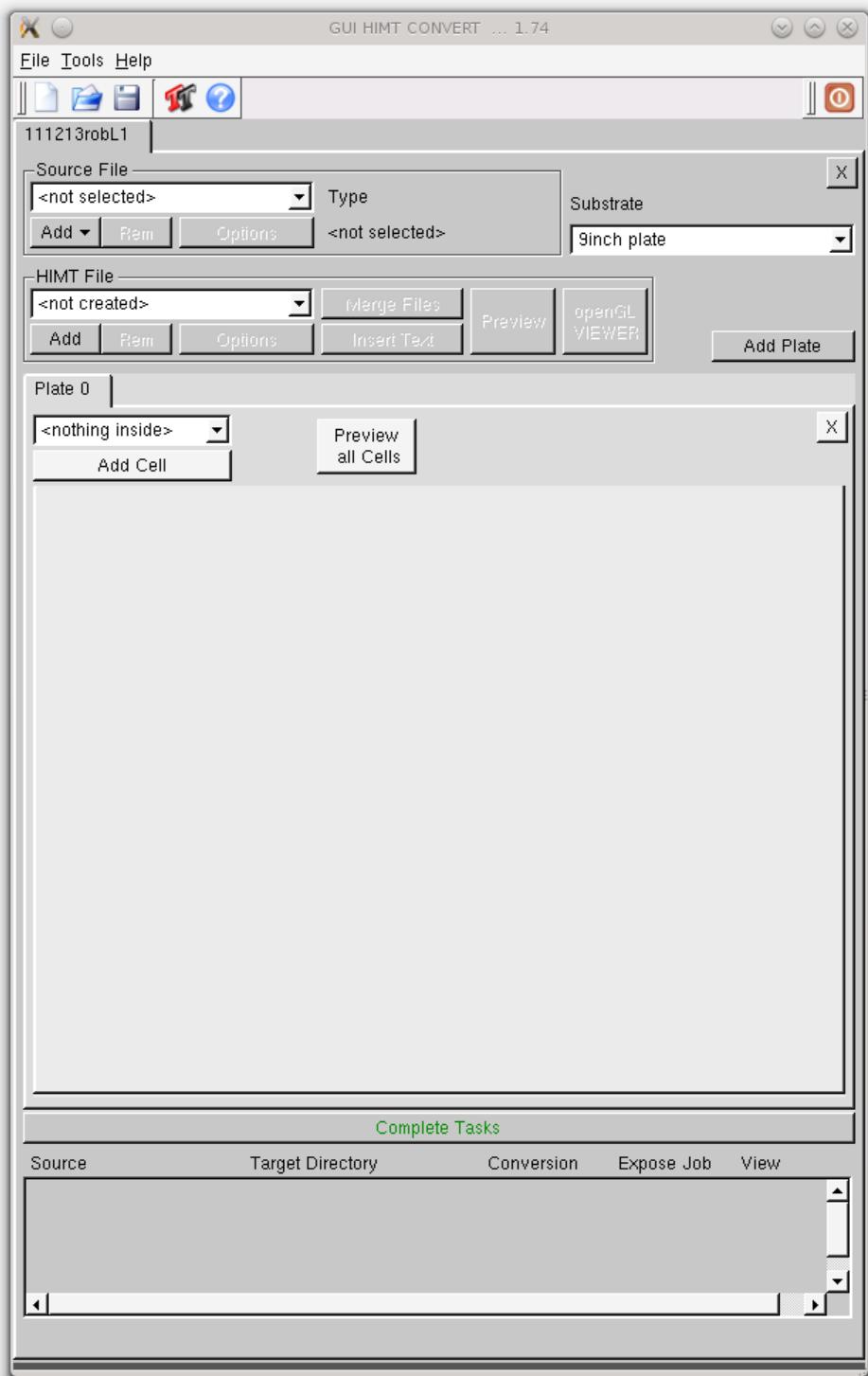


Click on the first icon as schematically illustrated above with an arrow to initiate the conversion sequence.

2. Set New Job window will appear. Within the 'Job Name' field please use the following convention to identify job names: **TodaysDateNameLX** where X represents the photolithography layer number. For instance, 111213robL1 would represent that the pattern data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID).

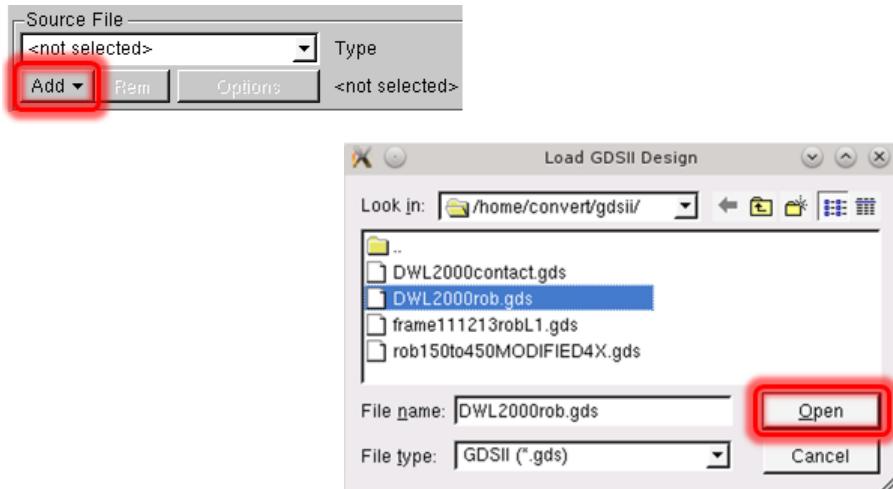


Click Ok.

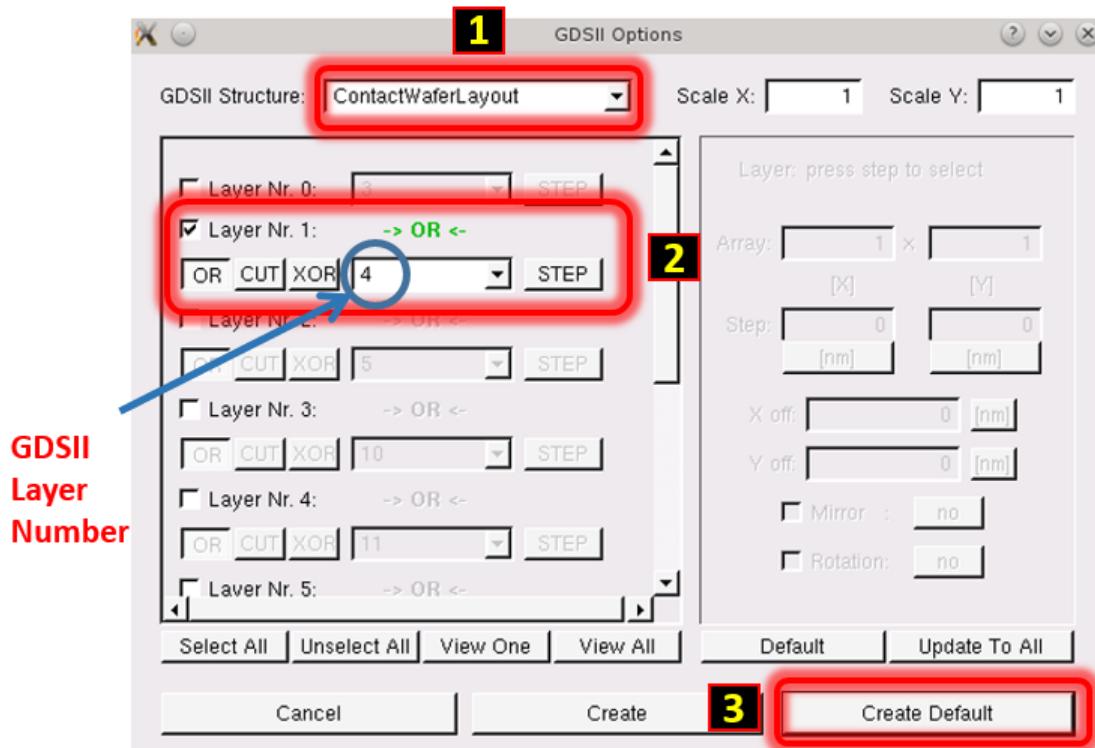


The menu will appear as displayed in the figure above.

3. Click Add then GDSII within the Source File submenu. Load GDSII Design window will appear.

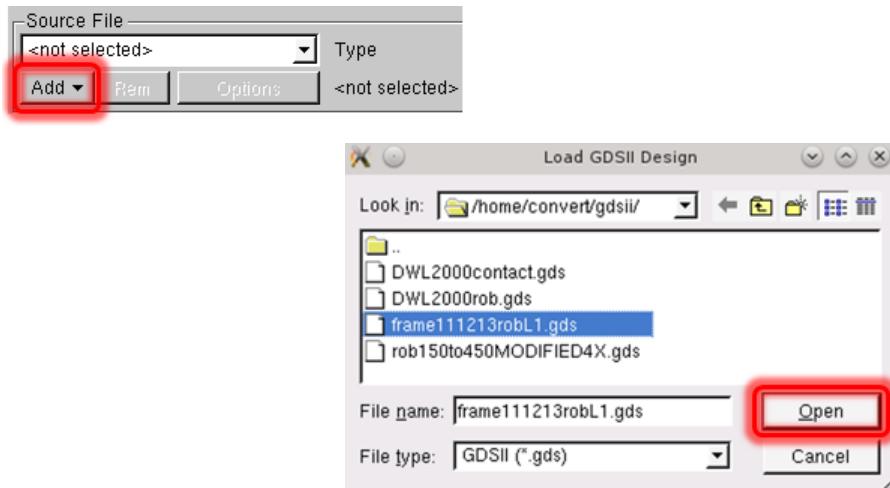


Select your GDSII pattern design file and click Open. GDSII Options menu will appear.

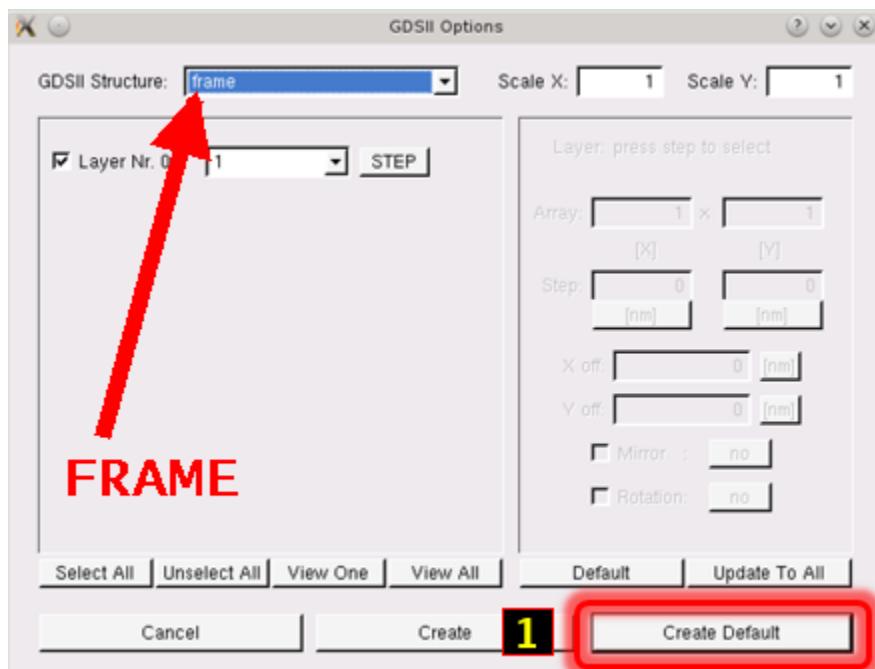


Choose the top-level GDSII Structure (Cell) of your pattern file. Default Scale values for X and Y are 1, which is correct for Contact Masks. Unselect all layers (use the button below the layers – or uncheck manually), then check only the layers you wish to convert. NOTE: Layer Nr. 0, 1, 2, 3, etc. are NOT GDSII layer numbers; GDSII Layer numbers are displayed in the field directly to the left of the STEP button. Click Create Default.

4. Click **Add** then **GDSII** within the Source File submenu. **Load GDSII Design** window will appear.

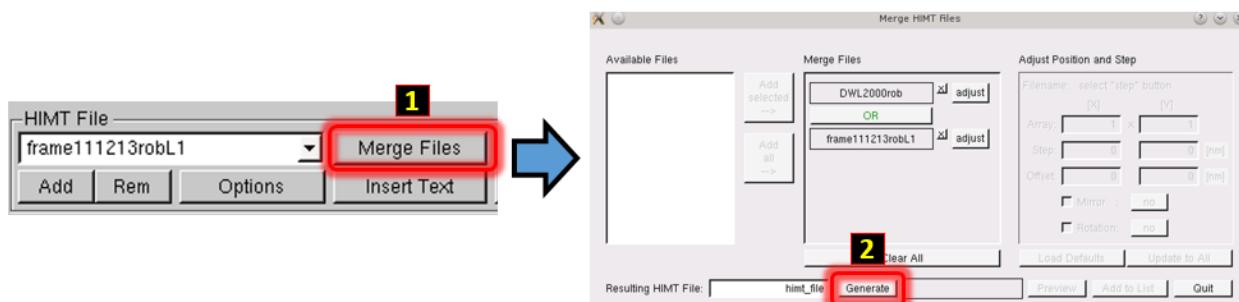


Choose the frame file that you created in the previous section using the Frame Generator. Click **Open**. **GDSII Options** menu will appear.

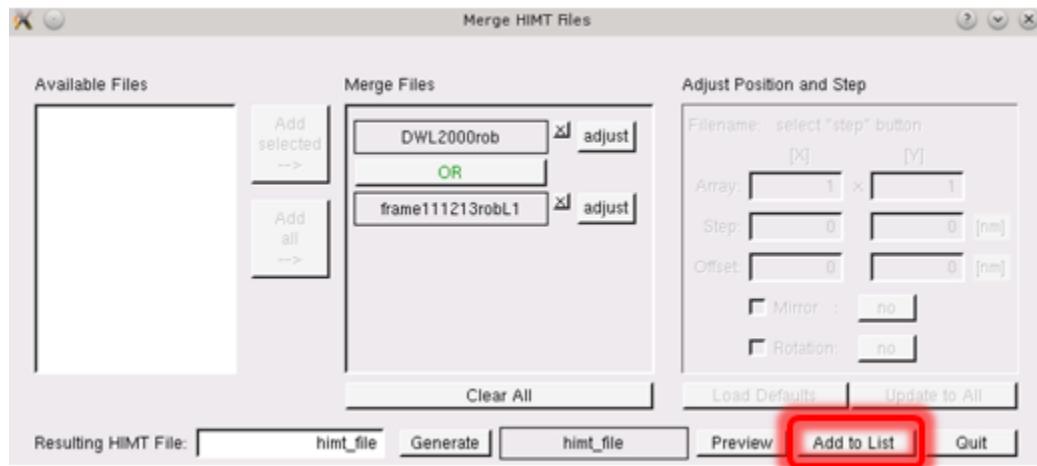


Value for the GDSII structure **MUST** have the value **frame**, the scaling for X and Y must be **1**. Don't change any values. Click **Create Default**.

5. Under "HIMT file" area reside both the pattern as well as the frame files. Click **Merge Files** button, the **Merge HIMT Files** window will appear. Both of the above HIMT files will appear in the **Available Files** portion of the menu. Click the **Add all** button. Both files will appear in the **Merge Files** portion of the menu as displayed below.

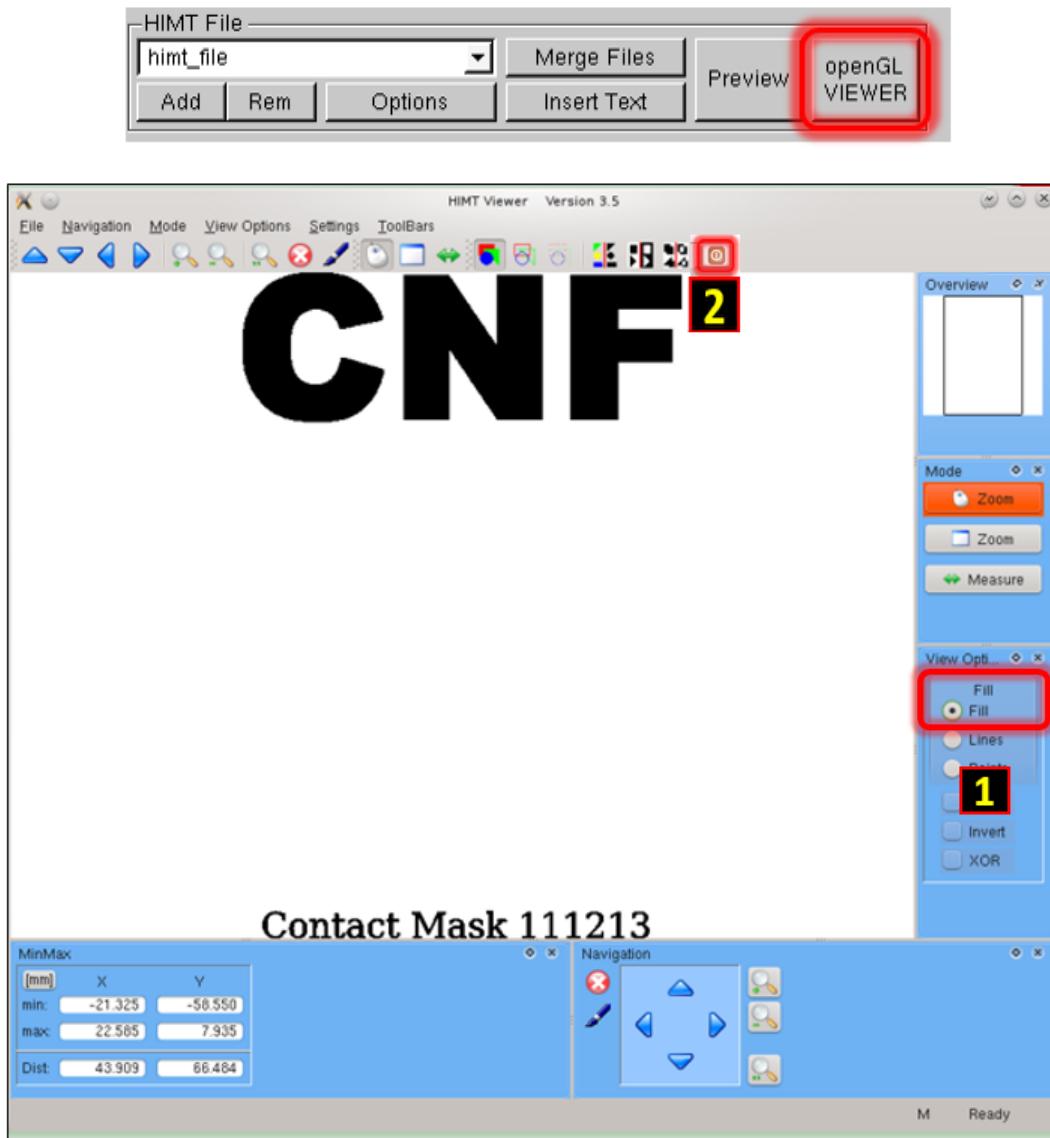


Default value for the generated HIMT file will be called 'himt_file', since we will convert one lithography level at a time this value does not matter. Click **Generate**. Several grayed out buttons to the right of **Generate** will appear active



Click **Add to List** within the **Merge HIMT Files** window. **himt_file** variable will be added to the **HIMT File** menu.

Click **openGL VIEWER** button to view your pattern.

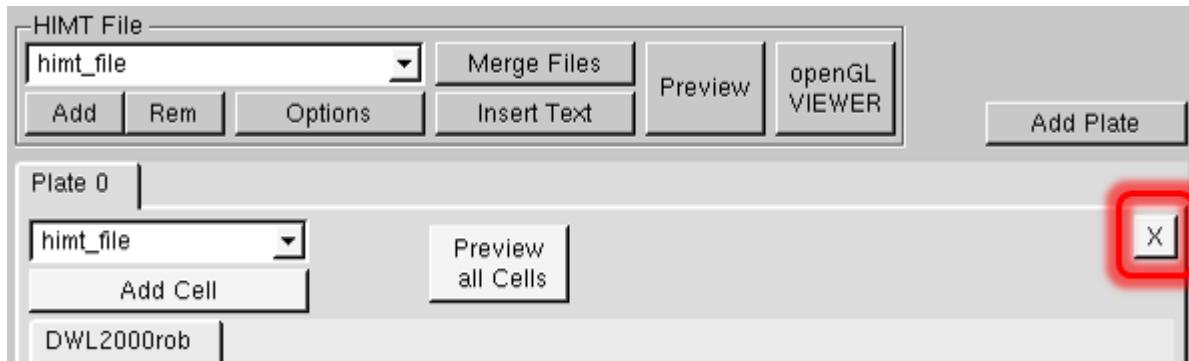


1. Click **Fill** within the viewer option menu. All exposed features will be solid black. Middle click and drag will pan the view, mouse wheel can be used to zoom in and out, etc.

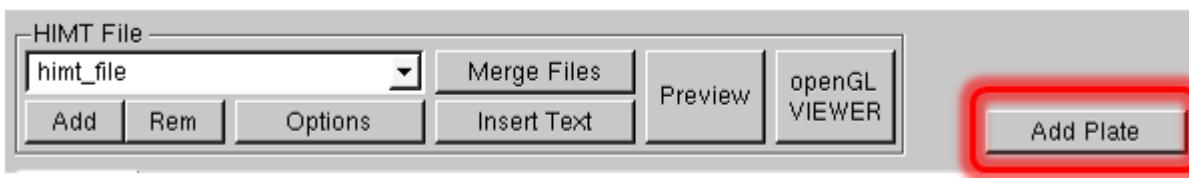
NOTE: The pattern is not mirrored and will be mirrored in a later step. Check the pattern extents (XMIN, XMAX, YMIN and YMAX values directly under the EXIT VIEWER button), as well as details of the pattern.

2. Click the red X button to close the openGL Viewer. Closing the window with upper right X will not stop viewer process, just the window, requiring the computer to be rebooted when the number of running viewers bogs down the system.

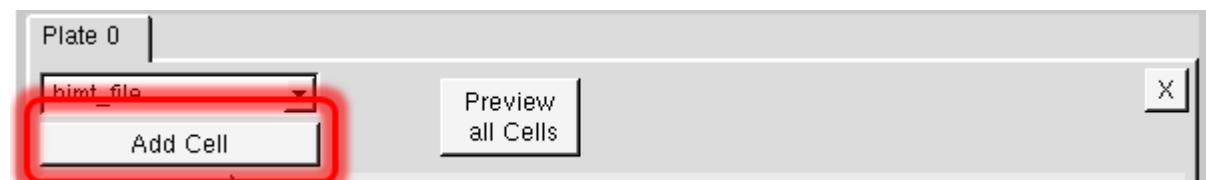
6. Under the **Plate 0** tab, click on the X (circled in red below) to remove the existing tab. The **Plate 0** tab will completely disappear.

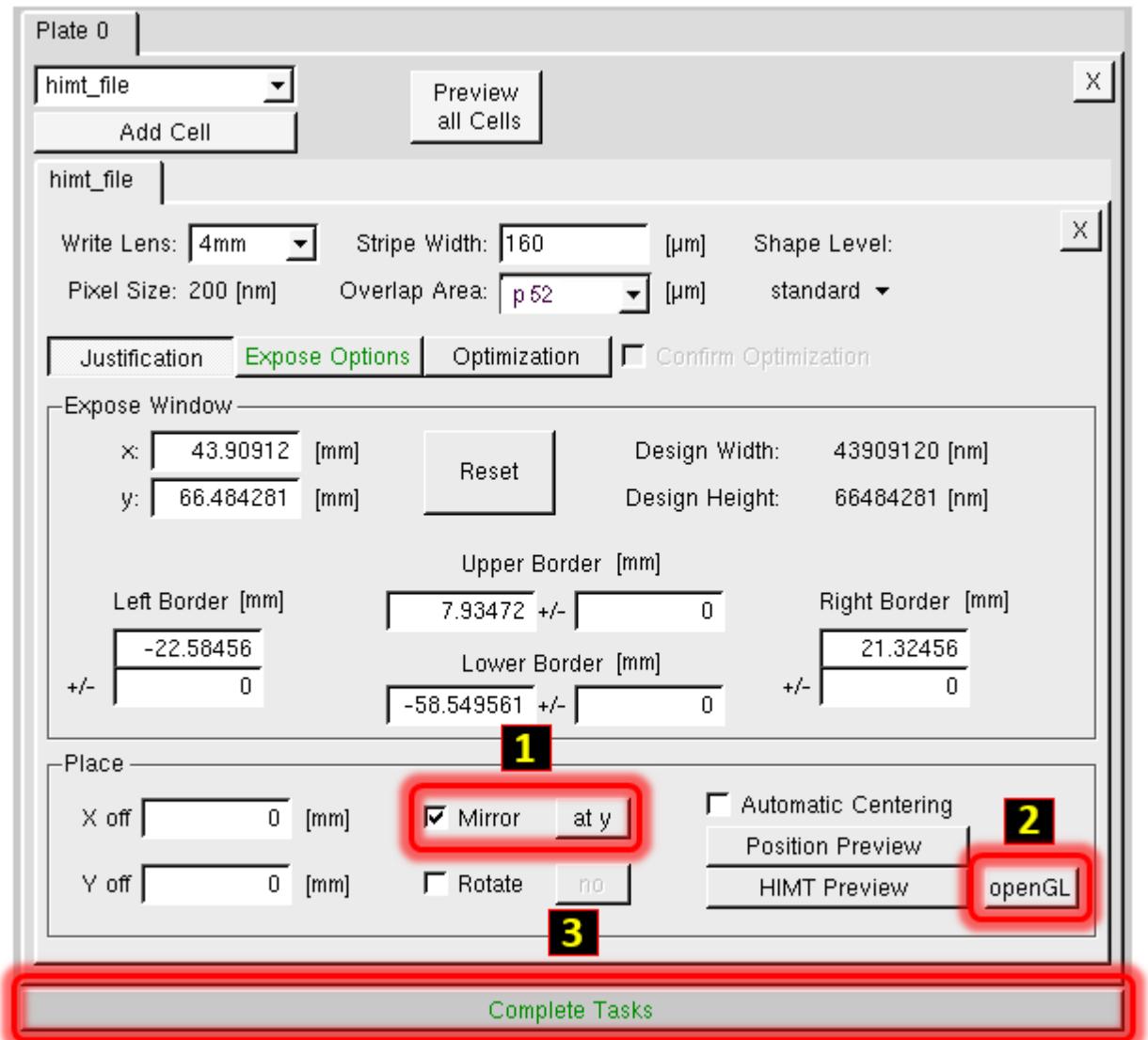


Click **Add Plate**. An empty **Plate 0** tab will appear



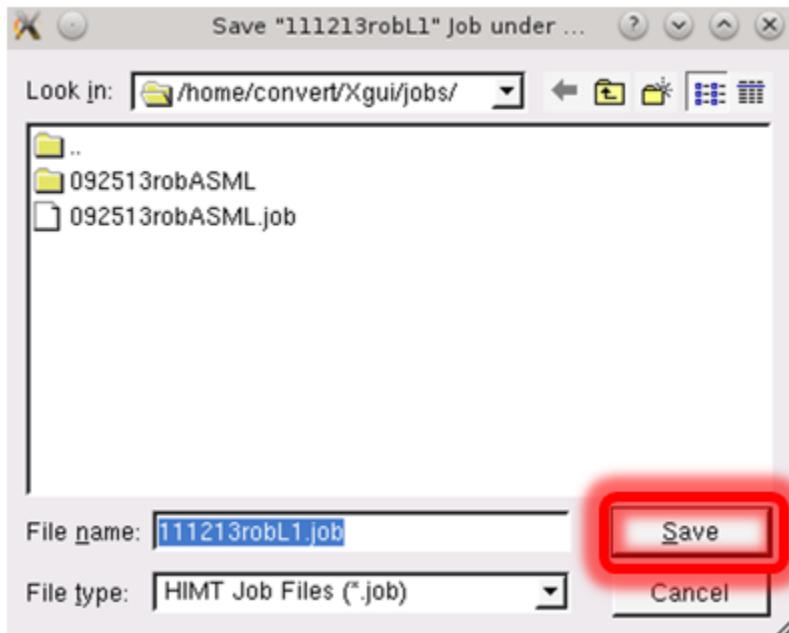
next to the **Add Cell** button. Choose the merged file called **himt_file**, then click **Add Cell** button and the **himt_file** tab will appear under the **Plate 0** tab.



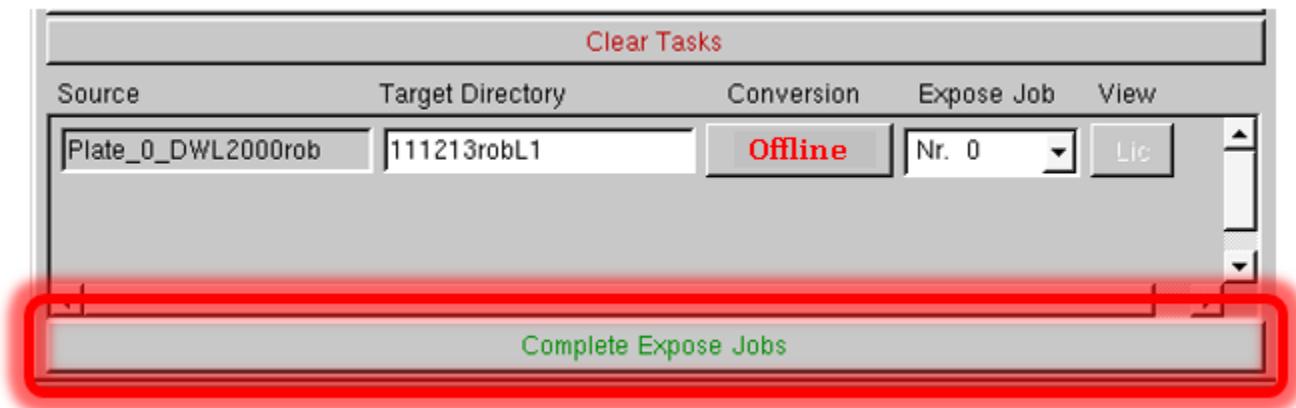


Within Place verify that to the left of **Mirror** the appears within the box. The default value **at y** is the correct value (step 1) EXCEPT for wafer backside exposures; consult Staff if unsure. Clicking on **openGL** (step 2) will allow you to view the data. The data now will appear correctly mirrored. Exit the openGL viewer when finished. Click **Complete Tasks**. **DO NOT MIRROR BACKSIDE MASKS.**

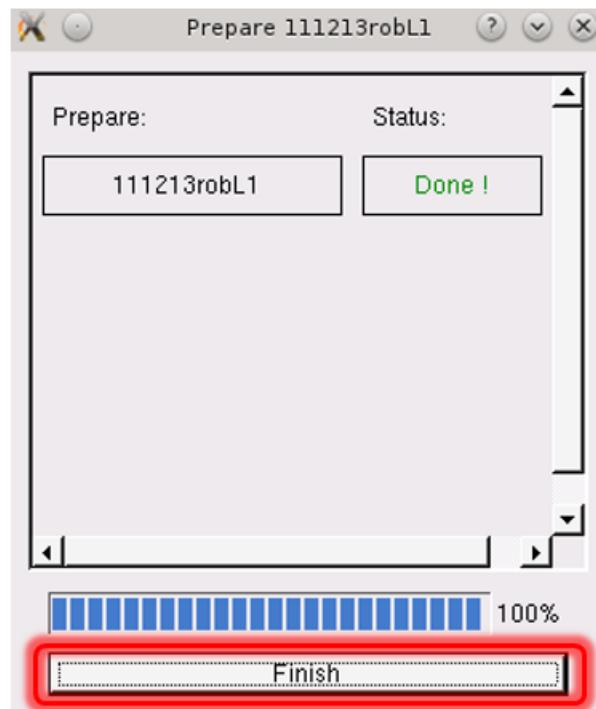
7. Click **Save** to save the job file. Use the same naming convention as described above (TodaysDateNameLX).



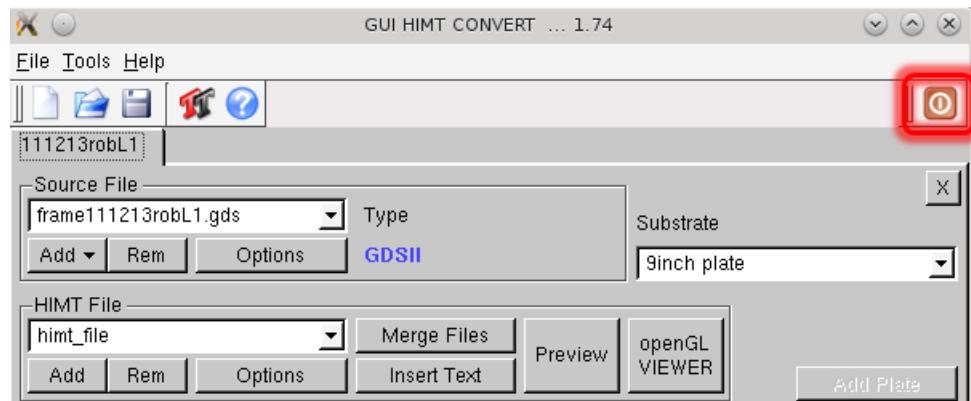
8. Lower portion of the **GUI HIMT CONVERT ... 1.74** menu will appear as in the above figure. Conversions will almost always be done Online. Click **Complete Expose Jobs**. Prepare menu will then appear.



9. Click **Finish** within the **Prepare** window.



10. Close the menu by clicking the highlighted button.

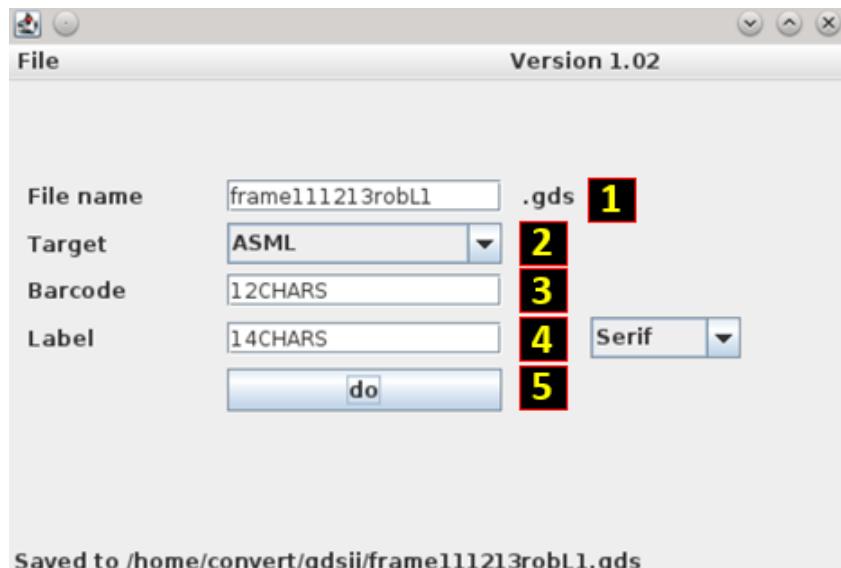


1.3 ASML STEPPER PATTERN CONVERSION

1.3.1 ASML Stepper Frame Generation

Frame Generator will create a GDSII file that will have reticle alignment marks for ASML steppers. The following marks are generated: barcode, label, and fiducial marks.

Using the Linux conversion computer double click on the Frame Generator icon.



1. File name field will already contain the string "frame". You must use the following naming convention: **frameTodaysDateNameLX** where X represents the photolithography layer number. For instance, frame111213robL1 would represent that the frame data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID). **DON'T USE** spaces, special characters, etc.
2. **AS200** is the default "Target", set the target to **ASML**.
3. Input a barcode – 12 Characters maximum – Use only letters and numbers
4. Input a mask label – 14 Characters maximum – Use only letters and numbers
5. Click **do**

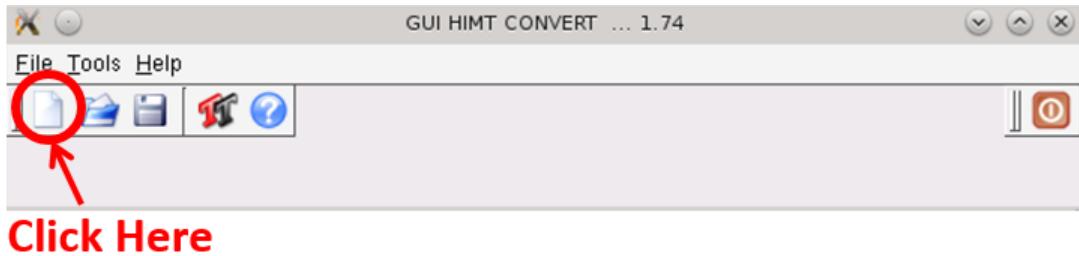
The frame template file will be saved under the /home/convert/gdsii directory
Click **File** Then **Close** to close the Frame Generation application.

1.3.2 ASML Stepper Pattern Conversion



1. To start the pattern conversion software, double click on the X-convert icon.

The **GUI HIMT CONVERT ... 1.74** menu will appear in the following fashion:

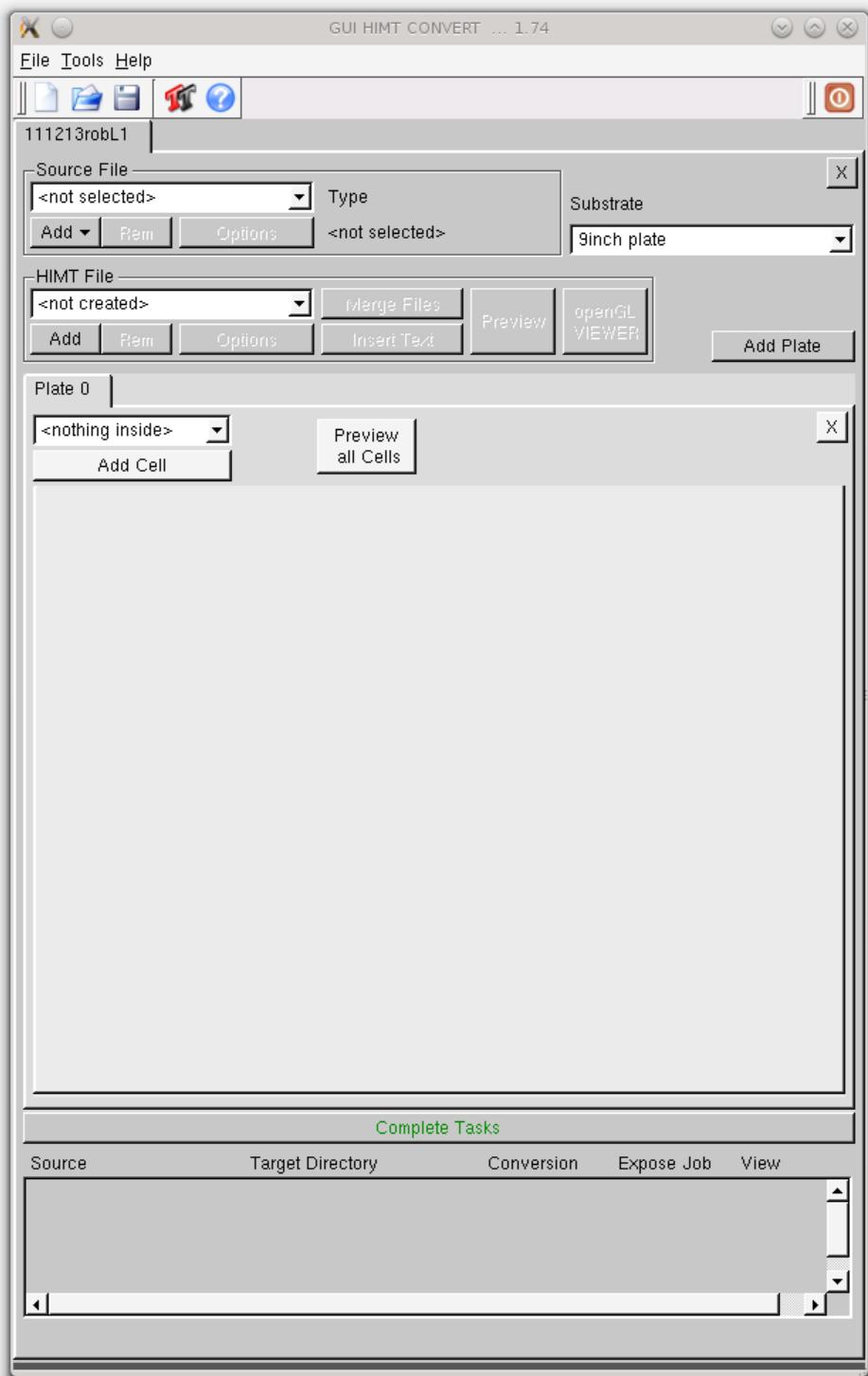


Click on the first icon as schematically illustrated above with an arrow to initiate the conversion sequence.

2. Set New Job window will appear. Within the 'Job Name' field please use the following convention to identify job names: **TodaysDateNameLX** where X represents the photolithography layer number. For instance, 111213robL1 would represent that the pattern data for the layer 1 photomask of the process was converted on November 12, 2013 (**TodaysDate = 111213**) by Rob (**Name = rob** – You could also use your NetID).

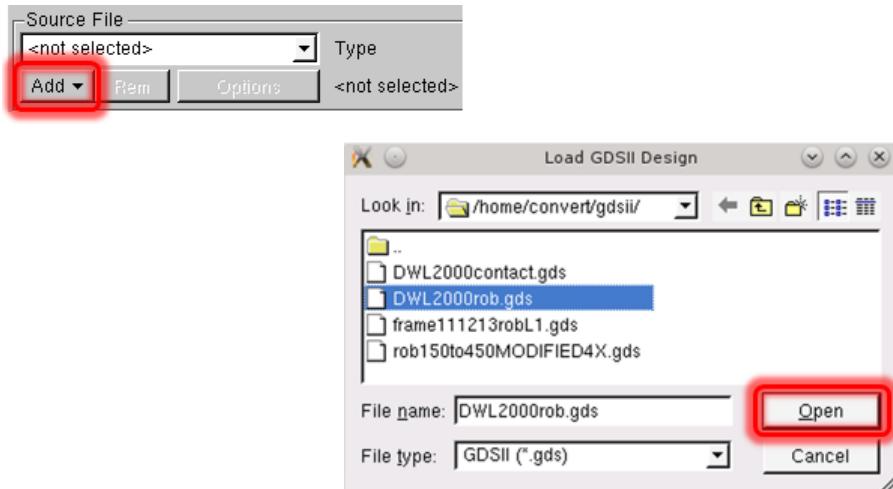


Click **Ok**.

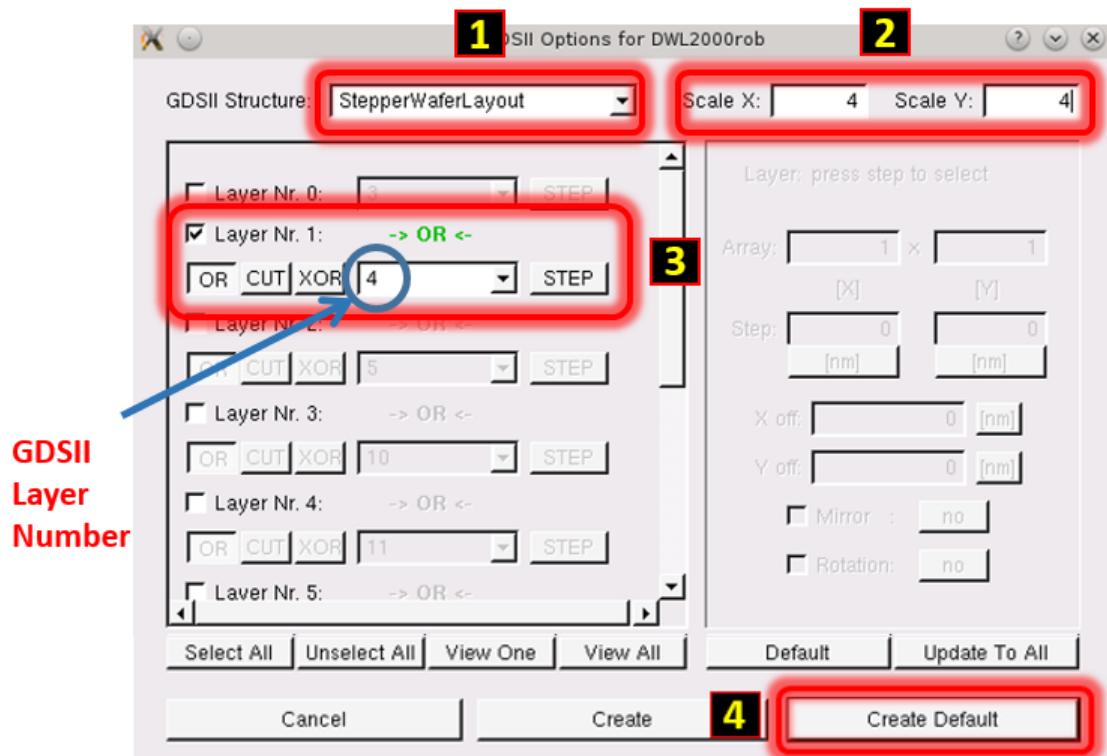


The menu will appear as displayed in the figure above.

3. Click Add then GDSII within the Source File submenu. Load GDSII Design window will appear.

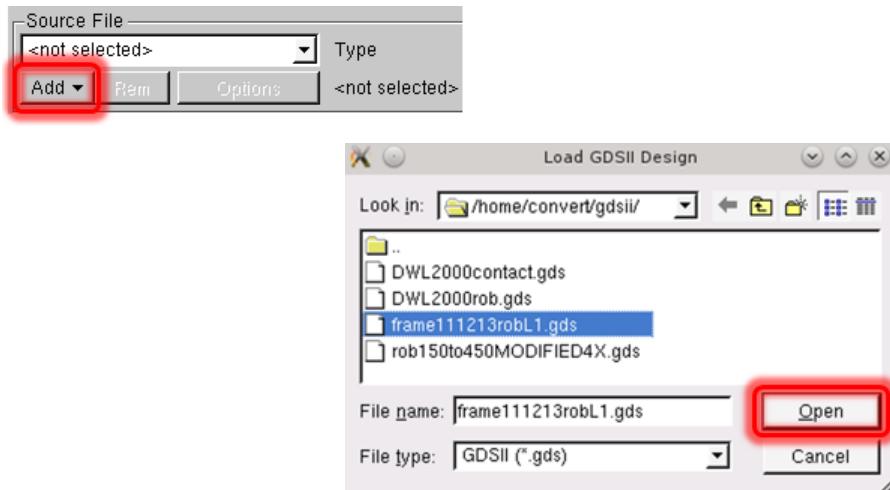


Select your GDSII pattern design file and click Open. GDSII Options menu will appear.

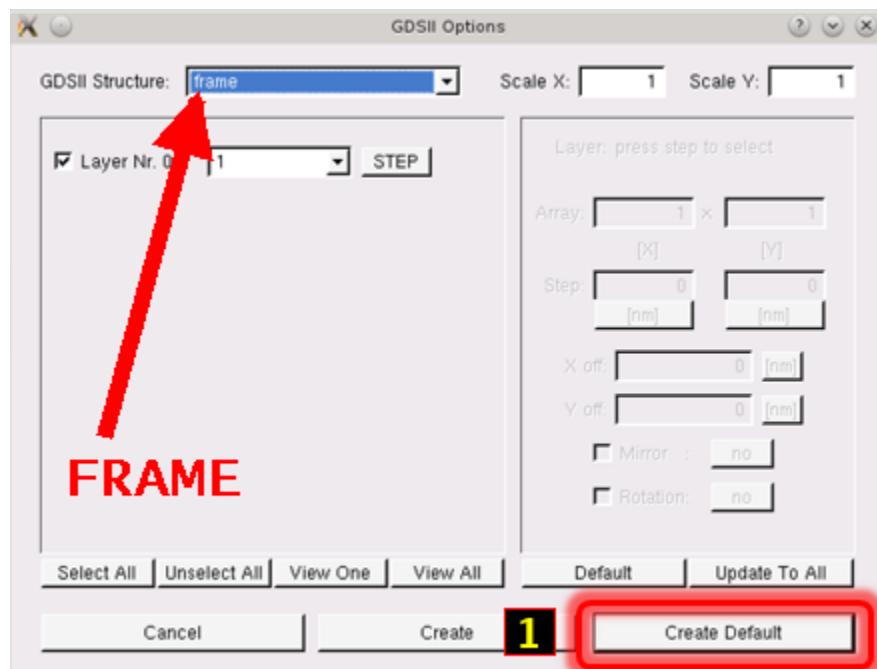


Choose the top-level GDSII Structure (Cell) of your pattern file. Default Scale values for X and Y are 1, and both must be set to 4. Unselect all layers (use the button below the layers – or uncheck manually), then check only the layers you wish to convert. NOTE: Layer Nr. 0, 1, 2, 3, etc. are NOT GDSII layer numbers; GDSII Layer numbers are displayed in the field directly to the left of the STEP button. Click Create Default.

4. Click **Add** then **GDSII** within the Source File submenu. **Load GDSII Design** window will appear.

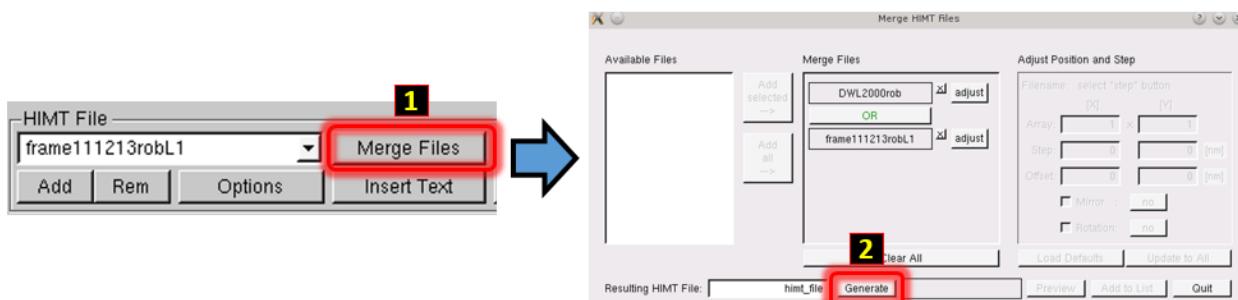


Choose the frame file that you created in the previous section using the Frame Generator. Click **Open**. **GDSII Options** menu will appear.

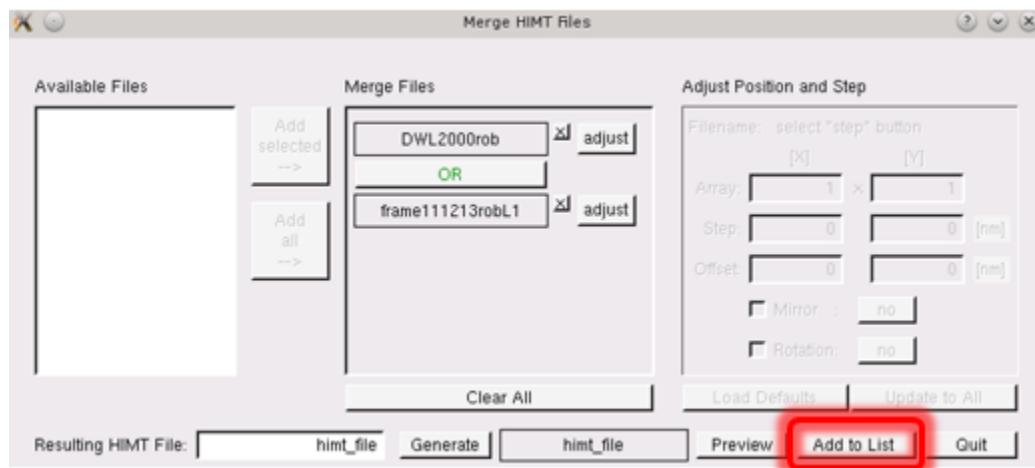


Value for the GDSII structure **MUST** have the value **frame**, the scaling for X and Y must be **1**. Don't change any values. Click **Create Default**.

5. Under "HIMT file" area reside both the pattern as well as the frame files. Click **Merge Files** button, the **Merge HIMT Files** window will appear. Both of the above HIMT files will appear in the **Available Files** portion of the menu. Click the **Add all** button. Both files will appear in the **Merge Files** portion of the menu as displayed below.

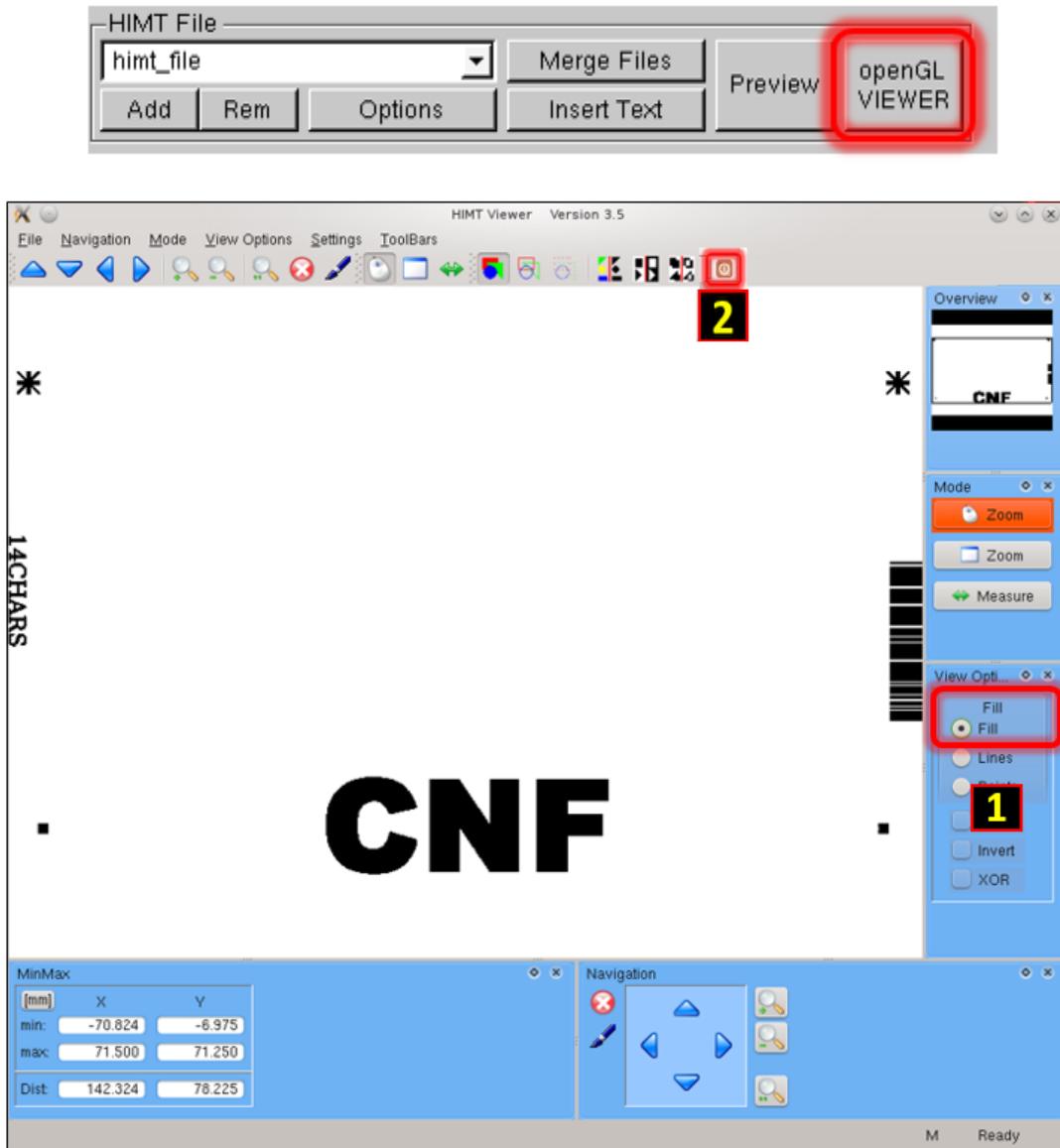


Default value for the generated HIMT file will be called 'himt_file', since we will convert one lithography level at a time this value does not matter. Click **Generate**. Several grayed out buttons to the right of **Generate** will appear active



Click **Add to List** within the **Merge HIMT Files** window. **himt_file** variable will be added to the **HIMT File** menu.

Click **openGL VIEWER** button to view your pattern.

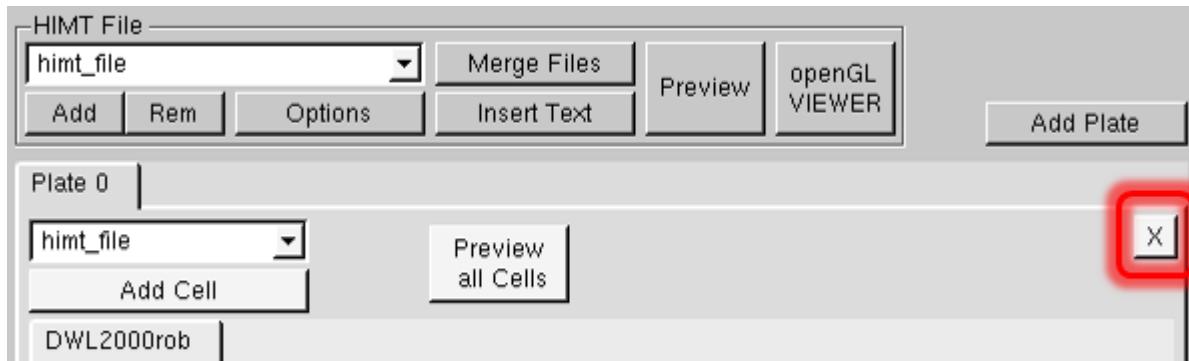


1. Click **Fill** within the viewer option menu. All exposed features will be solid black. Middle click and drag will pan the view, mouse wheel can be used to zoom in and out, etc.

NOTE: The pattern is not mirrored and will be mirrored in a later step. Check the pattern extents (XMIN, XMAX, YMIN and YMAX values directly under the EXIT VIEWER button), as well as details of the pattern.

2. Click the red X button to close the OpenGL Viewer. Closing the window with upper right X will not stop viewer process, just the window, requiring the computer to be rebooted when the number of running viewers bogs down the system.

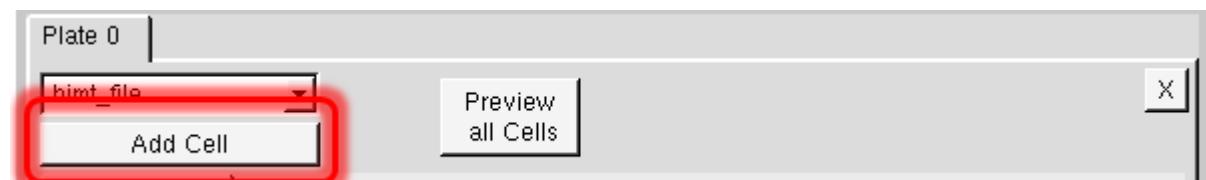
6. Under the **Plate 0** tab, click on the X (circled in red below) to remove the existing tab. The **Plate 0** tab will completely disappear.

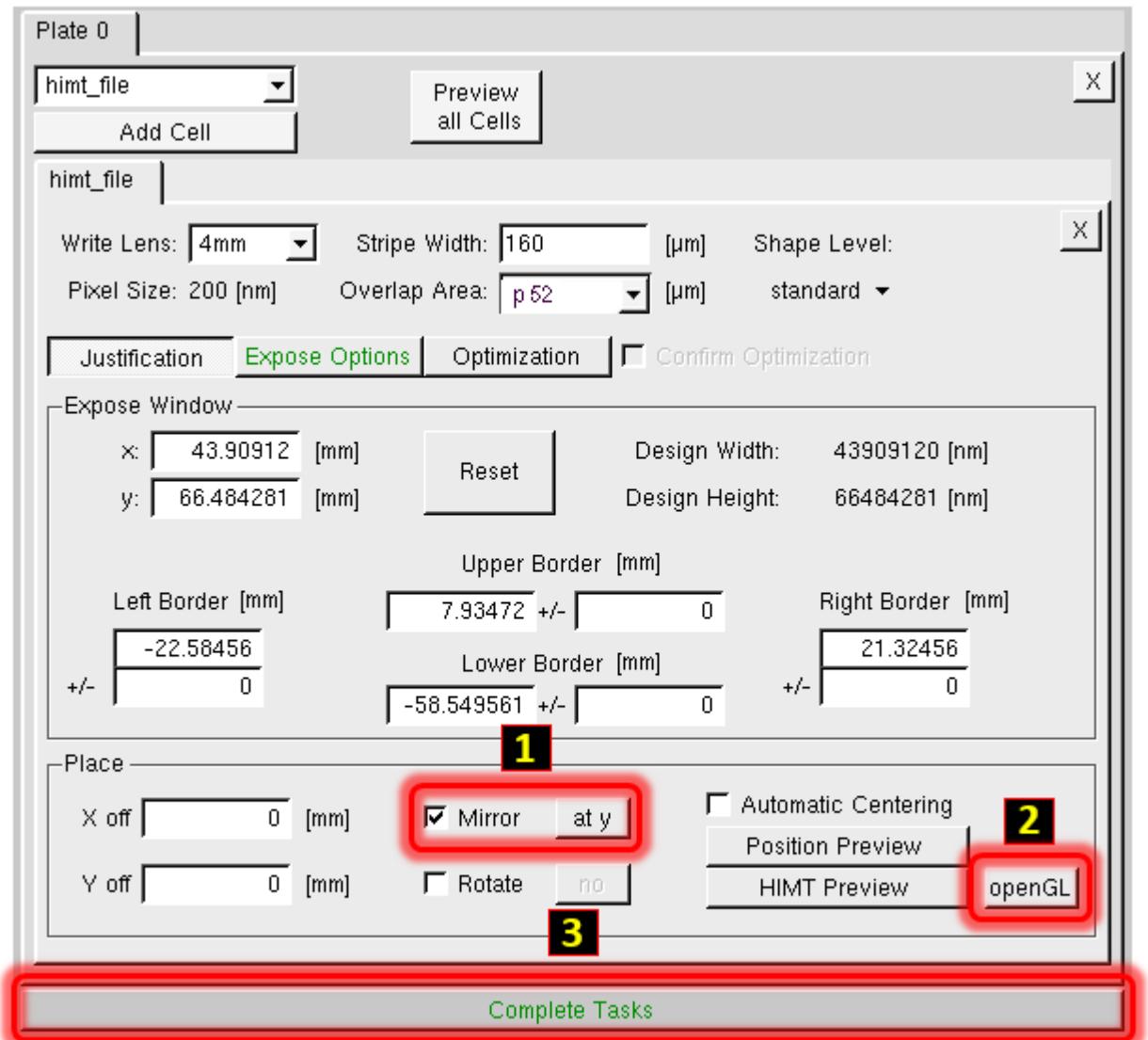


Click **Add Plate**. An empty **Plate 0** tab will appear



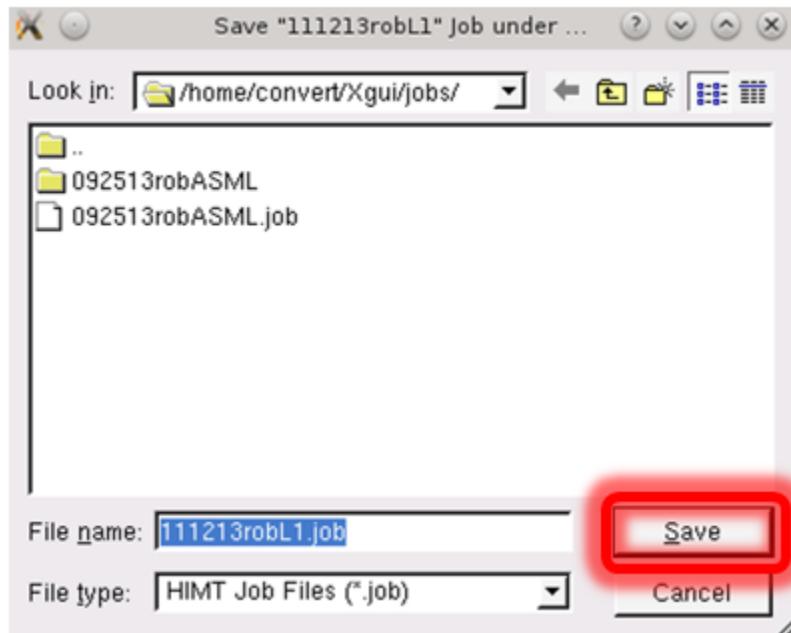
next to the **Add Cell** button. Choose the merged file called **himt_file**, then click **Add Cell** button and the **himt_file** tab will appear under the **Plate 0** tab.



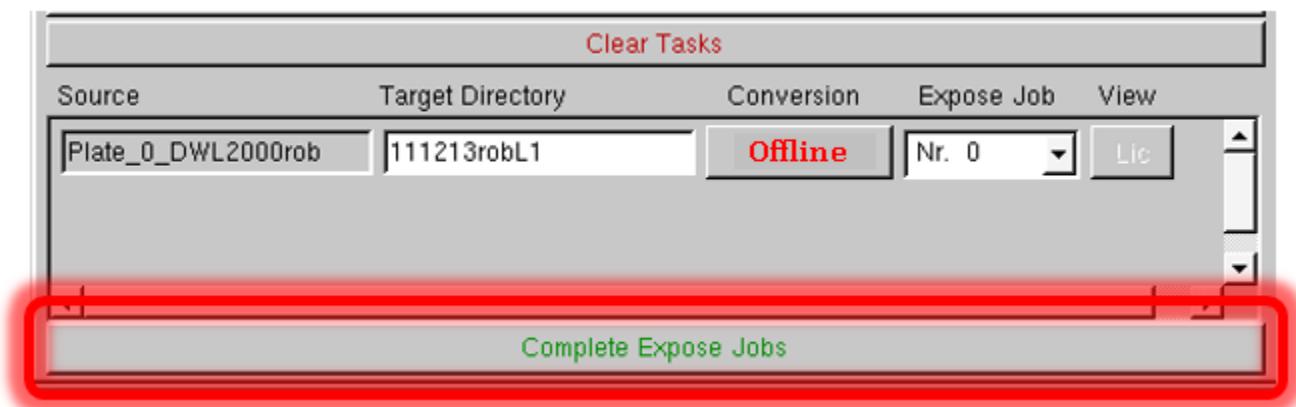


Within Place verify that to the left of **Mirror** the appears within the box. The default value **at y** is the correct value (step 1) EXCEPT for wafer backside exposures; consult Staff if unsure. Clicking on **openGL** (step 2) will allow you to view the data. The data now will appear correctly mirrored. Exit the openGL viewer when finished. Click **Complete Tasks**.

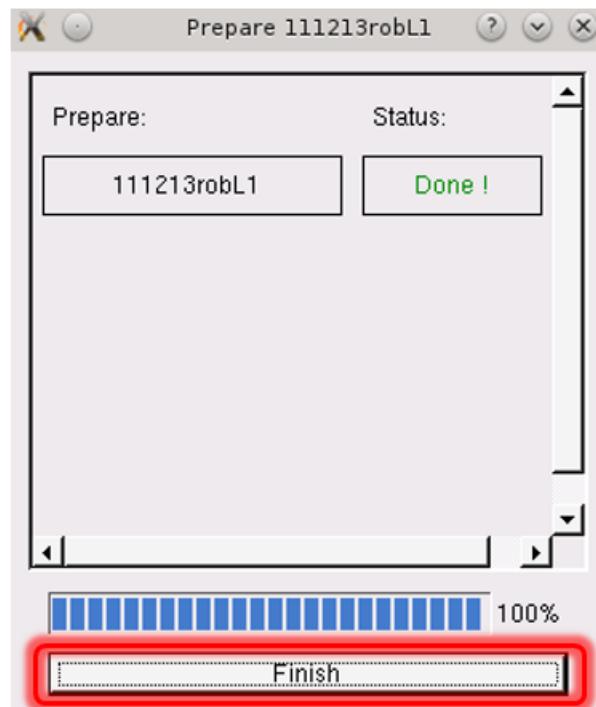
7. Click **Save** to save the job file. Use the same naming convention as described above (TodaysDateNameLX).



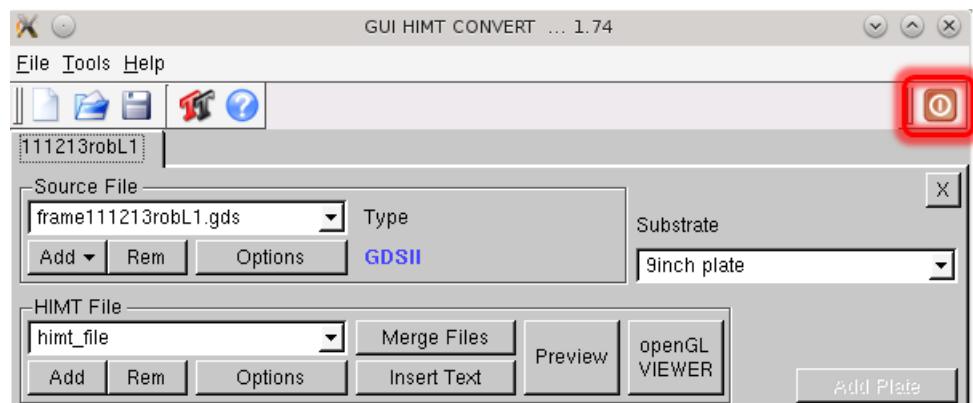
8. Lower portion of the **GUI HIMT CONVERT ... 1.74** menu will appear as in the above figure. Conversions will almost always be done Online. Click **Complete Expose Jobs**. Prepare menu will then appear.



9. Click **Finish** within the **Prepare** window.

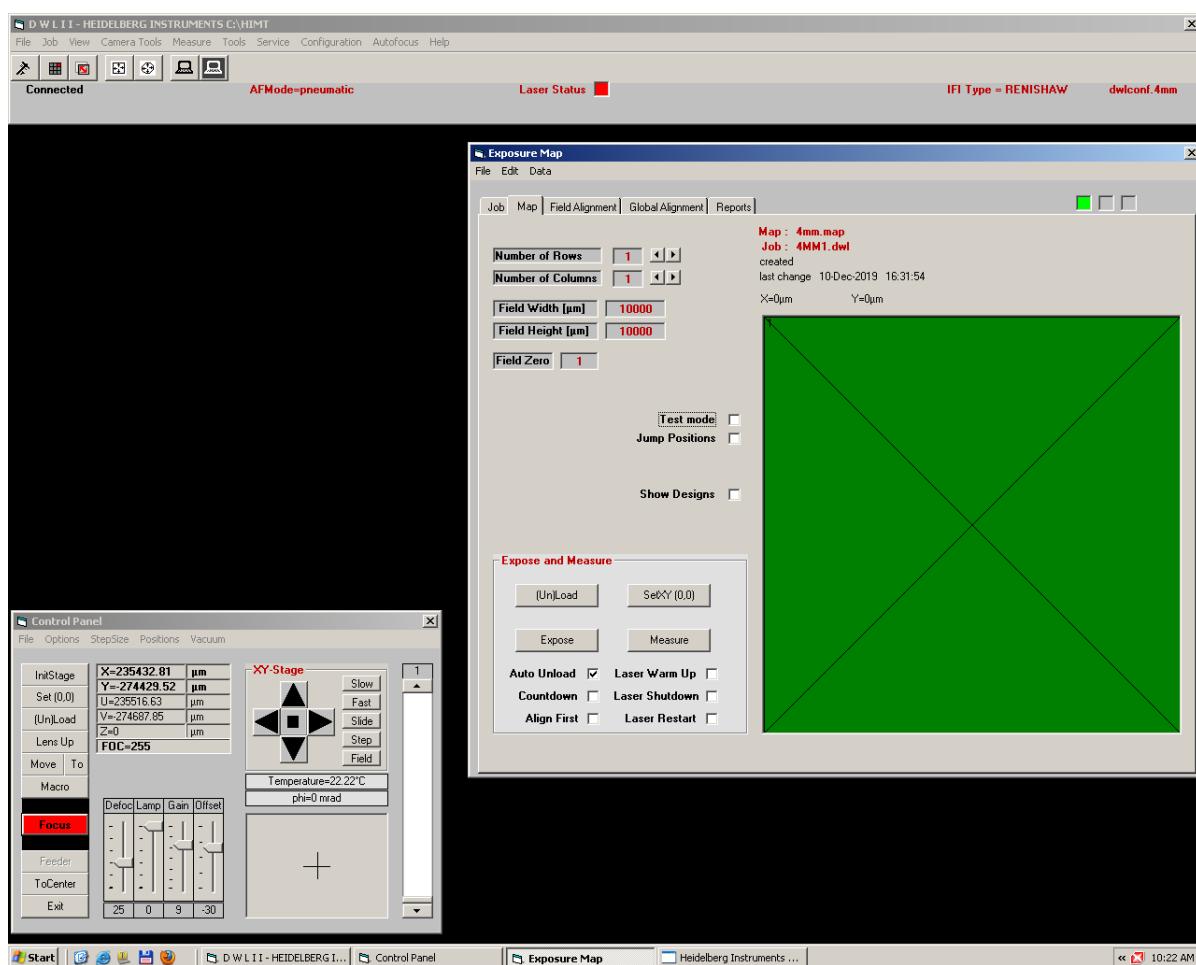


10. Close the menu by clicking the highlighted button.



2. DWL 2000 MASK WRITING

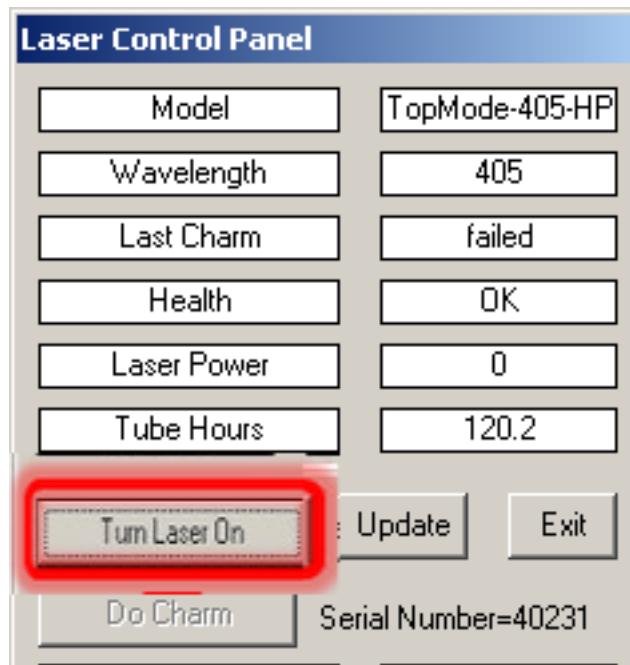
1. Log into NEMO to enable keyboard and mouse. The DWLII Menu will already be open. If not, **notify Staff**. If the Exposure Map and Control Panel windows are not open click  to start the Control Panel window, and click  to open the Exposure Map window.
2. **Laser Status** should be red indicating that the laser is off.



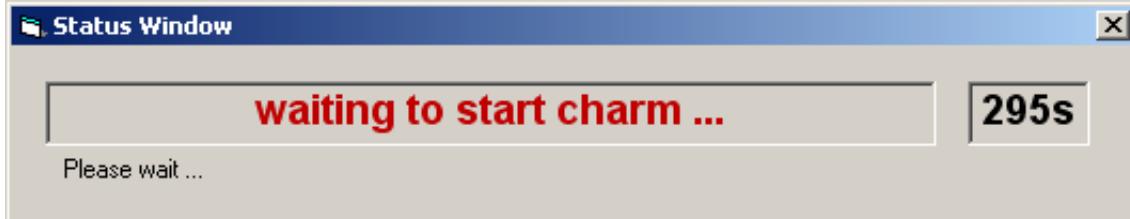
3. Click Tools, then choose Laser Control



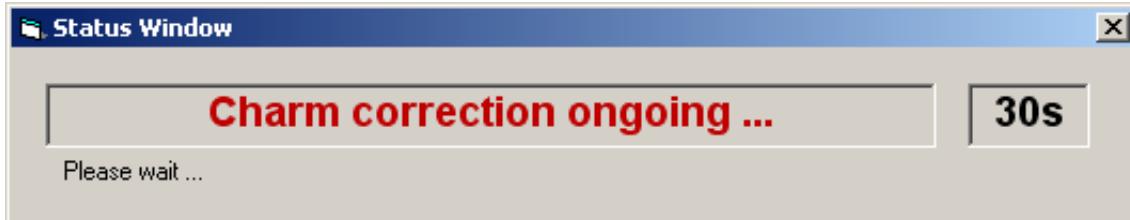
Laser Control Panel window will appear, click Turn Laser On.



The **Status Window** box will appear indicating that the laser is warming up before running Charm. It will take 5 minutes.



After warm up, the **Status Window** box will appear indicating that the Charm process is running. It will take about two minutes.



DO NOT click on anything until Charm is completed!

During the warmup and Charm cycle, you should load your photomask onto the stage.

4. LOADING A MASK

Open the door to the DWL 2000 chamber by using the door switch located on the left hand side of the environmental chamber (see figure below).

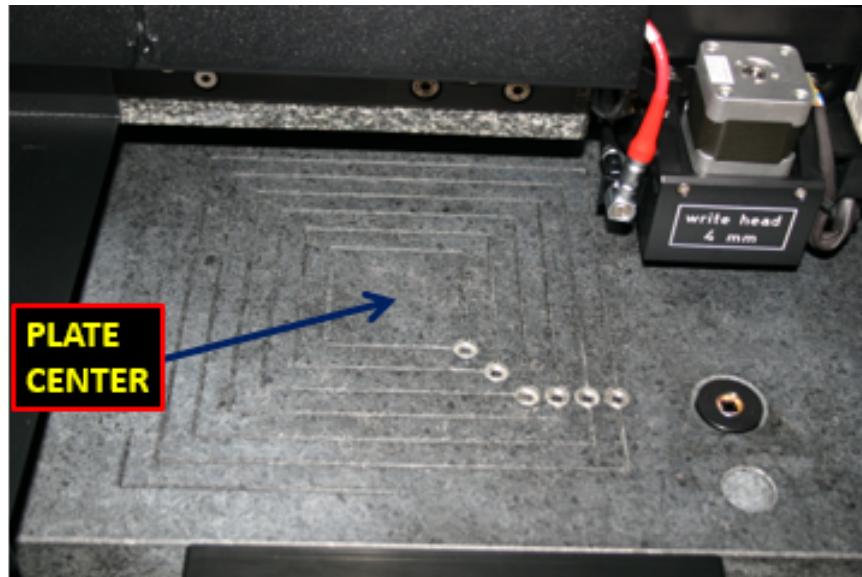


The door will slowly rise.

Lift highlighted handle in the figure below.



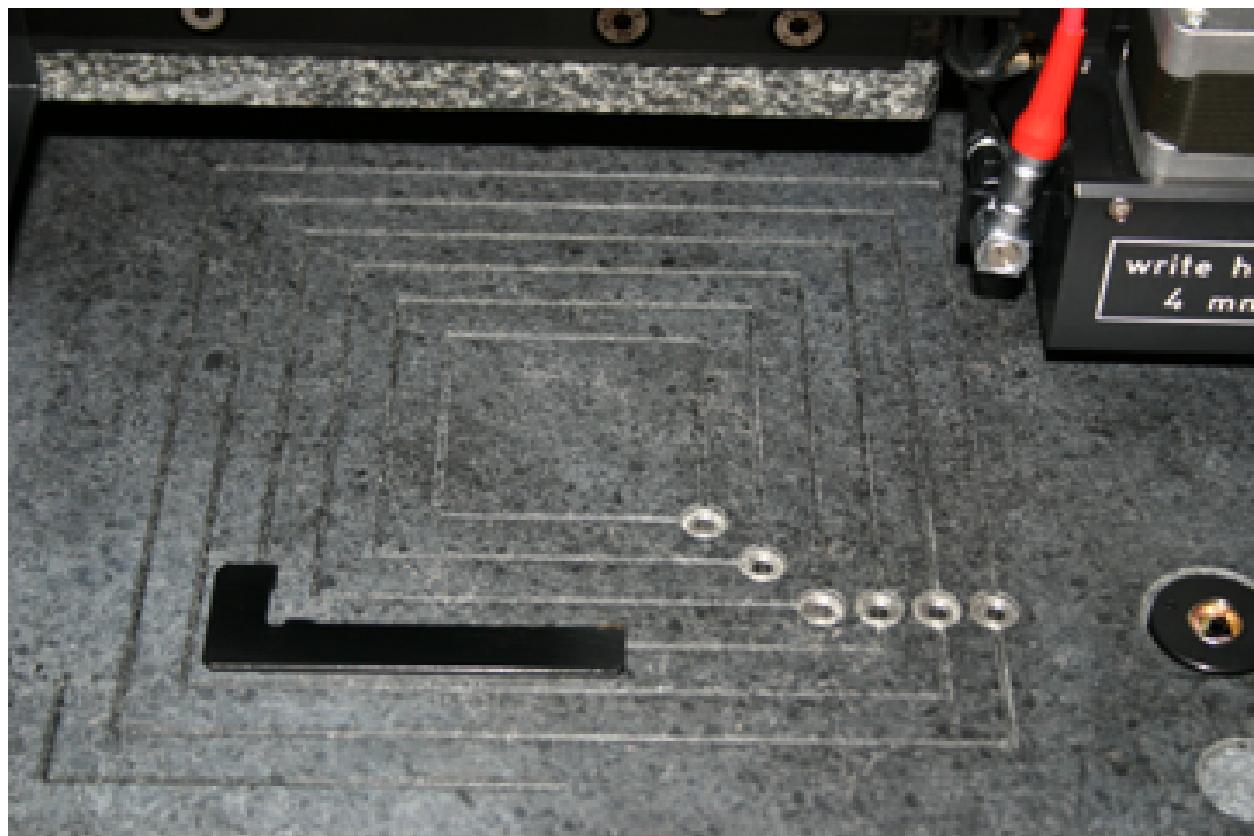
The stage and write head will appear as in the following figure. The 4mm write head will be to the right of the center of the plate; this is the load/unload position.



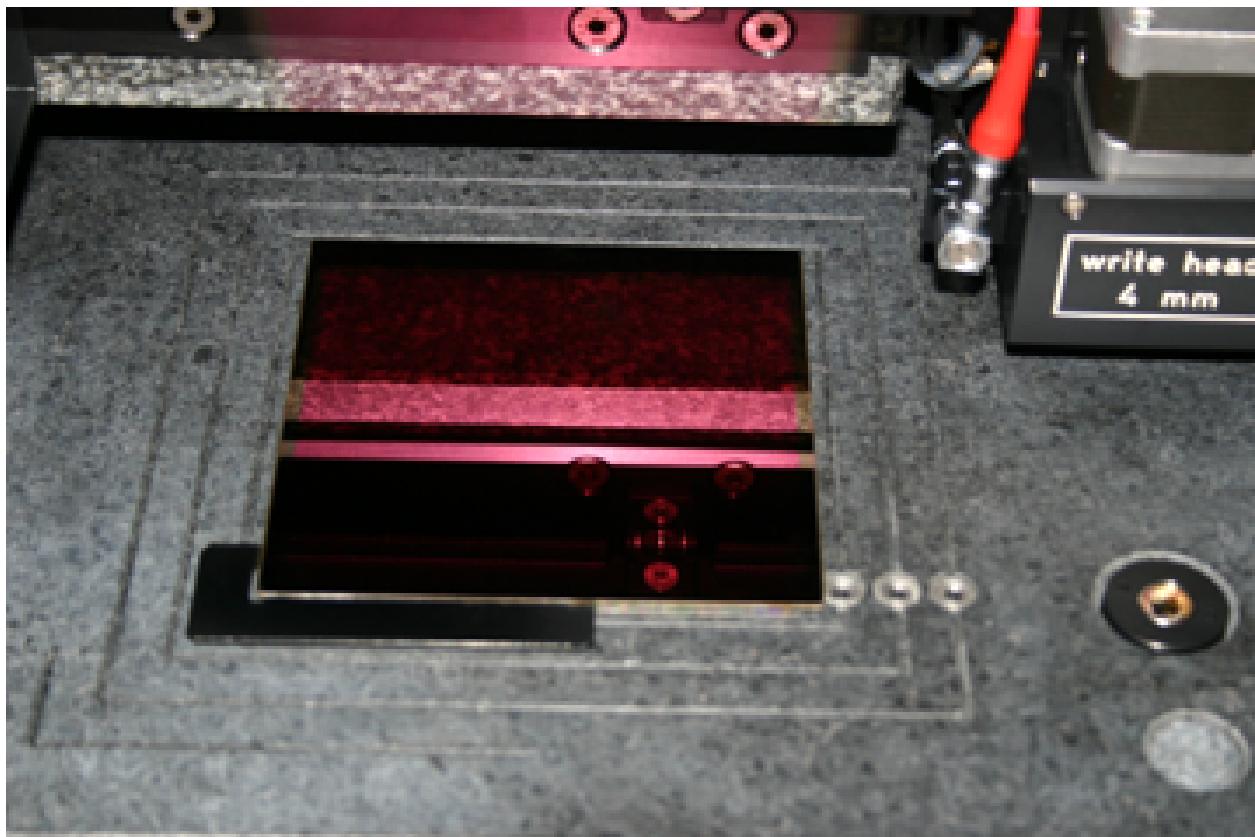
If the system is not in this configuration and the center of the plate is underneath the writehead **STOP! DON'T ATTEMPT TO LOAD A MASK PLATE**, close the door, wait until it's fully closed, then in the Exposure Map window click the **(Un)Load** button. If this does not bring the stage to the load/unload position displayed in the previous figure, **STOP** and contact Staff.

Place the L-shaped mask guide in the 4th groove (for 5 inch masks) from the center as shown in the figure below.

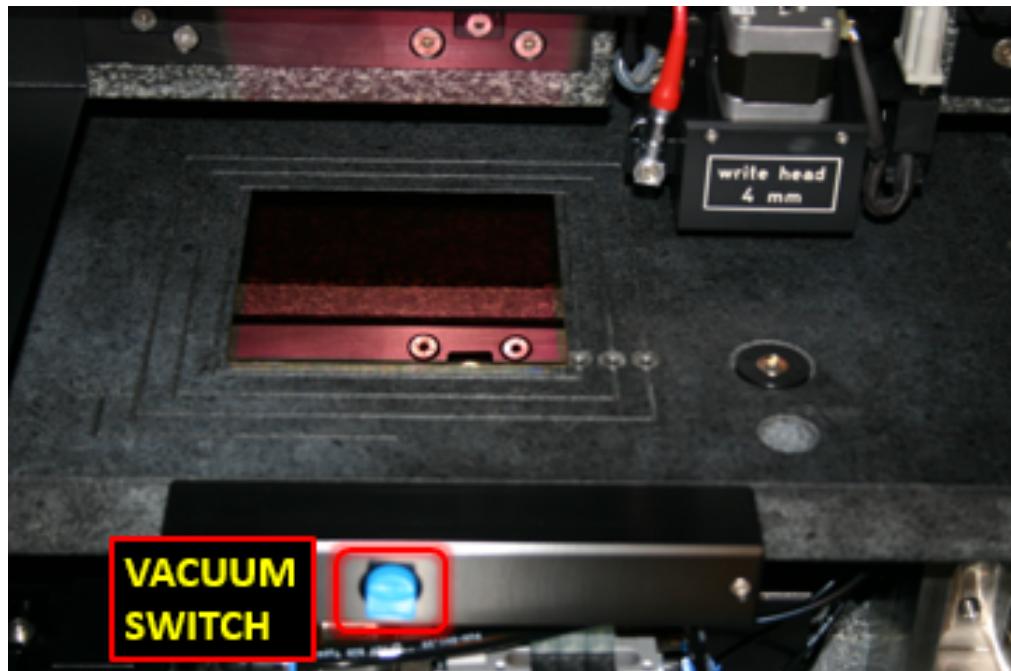
**4th groove from center for 5 inch masks
5th groove from center for 6 inch masks**



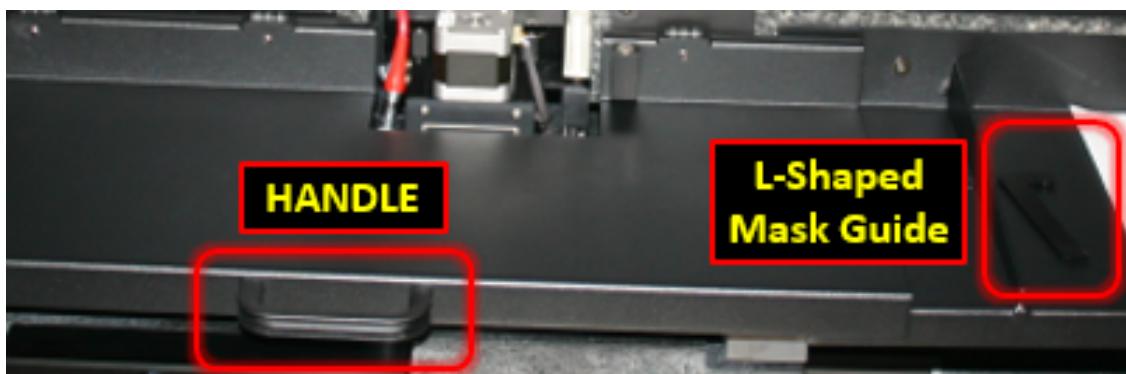
Place reticle against the L-shaped mask guide with the resist side facing up. The following figure illustrates the correct configuration of the setup. Be **CERTAIN** that the mask is securely against both sides of the alignment guide. ANY ROTATION MAY MAKE THE MASK UNUSABLE.



Apply vacuum and remove the L-shaped mask guide. Place the L-shaped mask guide on the shelf directly to the right of the handle lid (see picture below).



Close Lid.

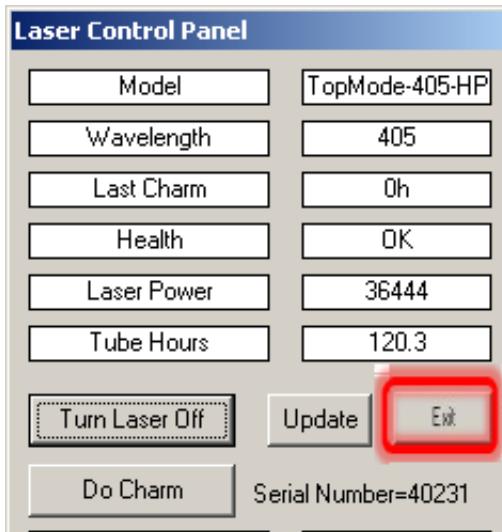


Close the door of the DWL 2000 Chamber using the switch (see figure below).

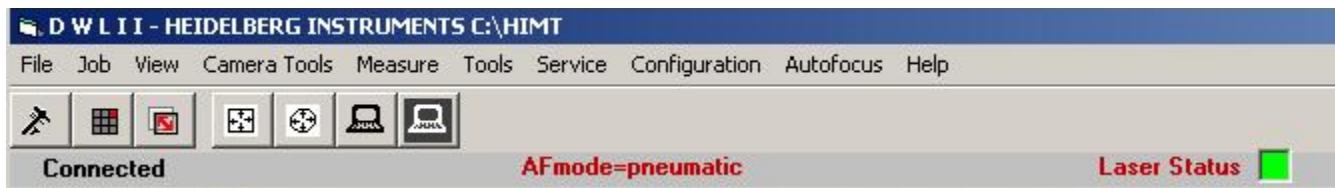


NOTE: When the main chamber door is open, the interlock disables any stage motion. Don't try to move, initialize, or home the stage with the door open.

5. The **Laser Control Panel** box will indicate when Charm is complete and the laser is ready. Click **Exit**.

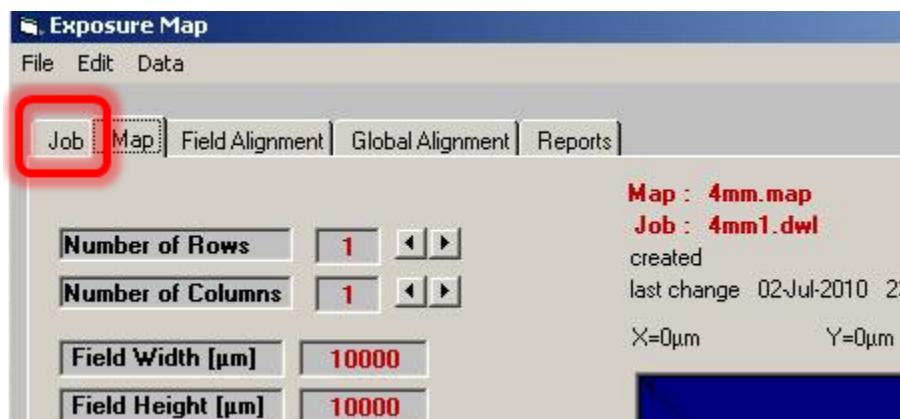


The **Laser Status** box will be green and the DWLII menu will appear as:

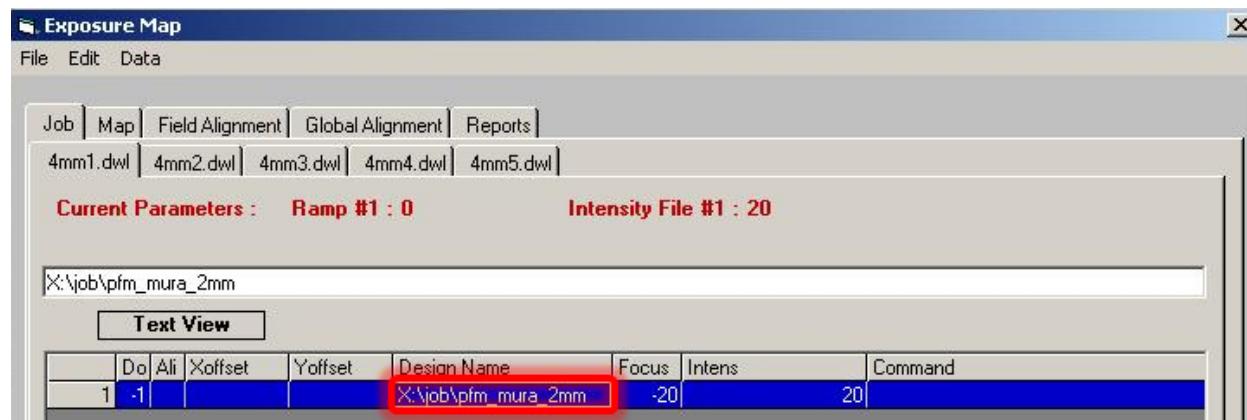


DO NOT continue until laser status is as above.

6. Once the laser warmup is complete, click on the **Job** tab in the **Exposure Map** window.

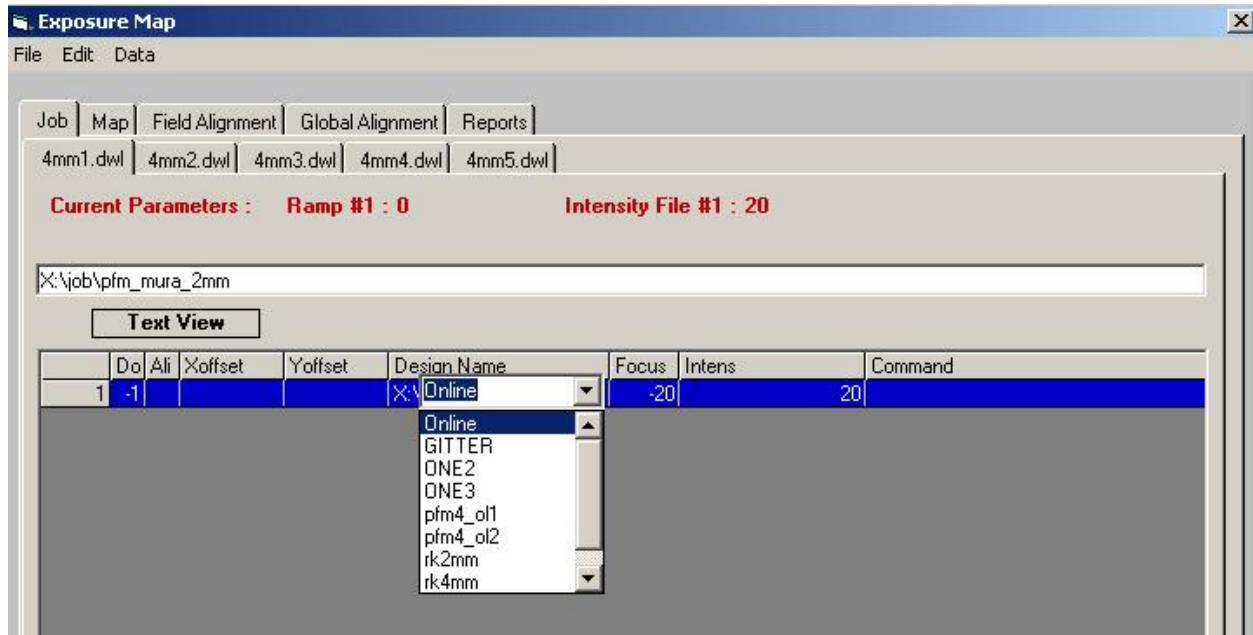


Click on the **Design Name** field to highlight contents. The field will have a yellow border when highlighted.

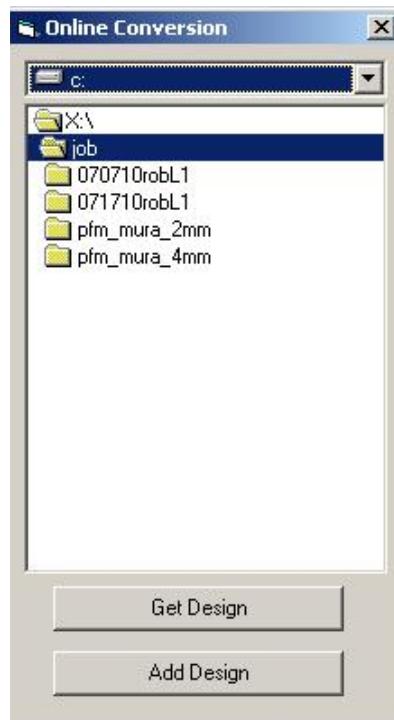


NOTE: Don't change **Do**, **Focus** or **Intens** values. **Do** is always equal to **-1**, **Focus** and **Intens** values will vary and may not be identical to the ones in the above figure. **CHECK FOR POSTED VALUES.**

Right click on the **Design Name** field, then click on the pull down menu arrow. The menu will appear as in the picture below. Choose **Online**.



Online Conversion window will appear as:



Double-click one time on the folder of the pattern file you wish to write. You will descend into the directory structure of your pattern file (see figure below). Click **Get Design**.



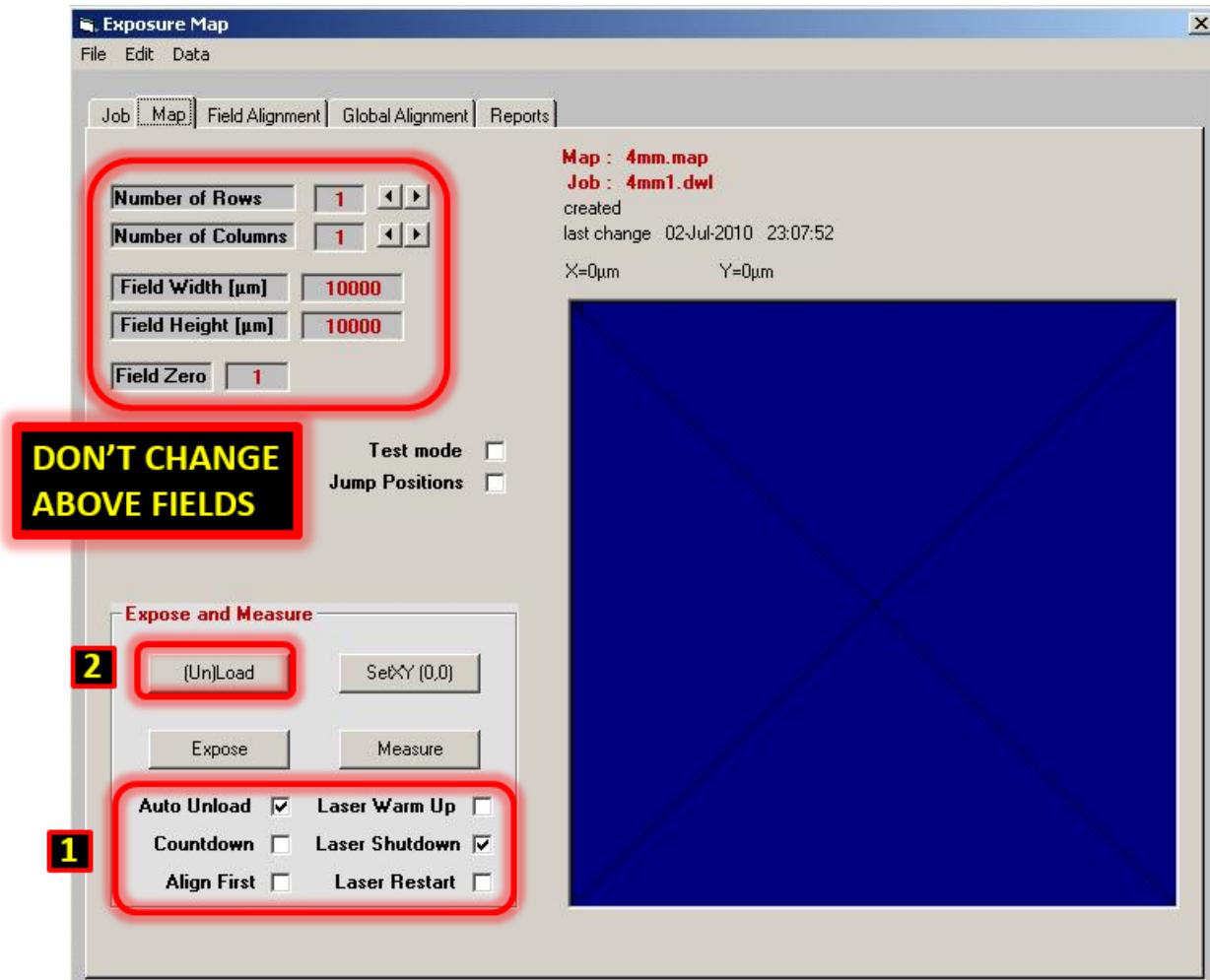
The job menu should now have the name of the file you wish to write and appear as:

	Do	Ali	Xoffset	Yoffset	Design Name	Focus	Intens	Command
1	-1				X:\job\070710robL1	-20	20	

Click on the **Map** tab:



7. Check **Laser Shutdown** to be sure that the laser turns off after the mask is finished, unless you are CERTAIN that another user is about to use the tool. Check **Auto Unload** to be sure that the stage moves to the load/unload position upon mask writing completion.



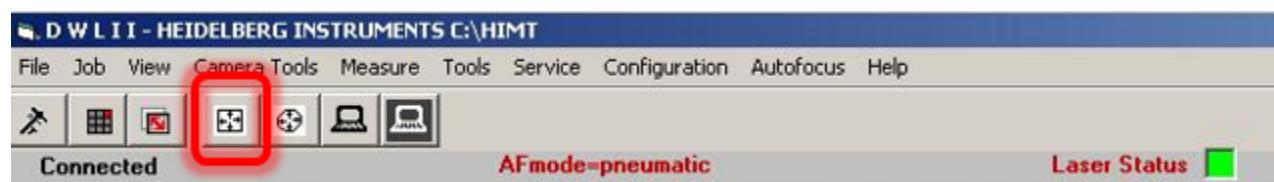
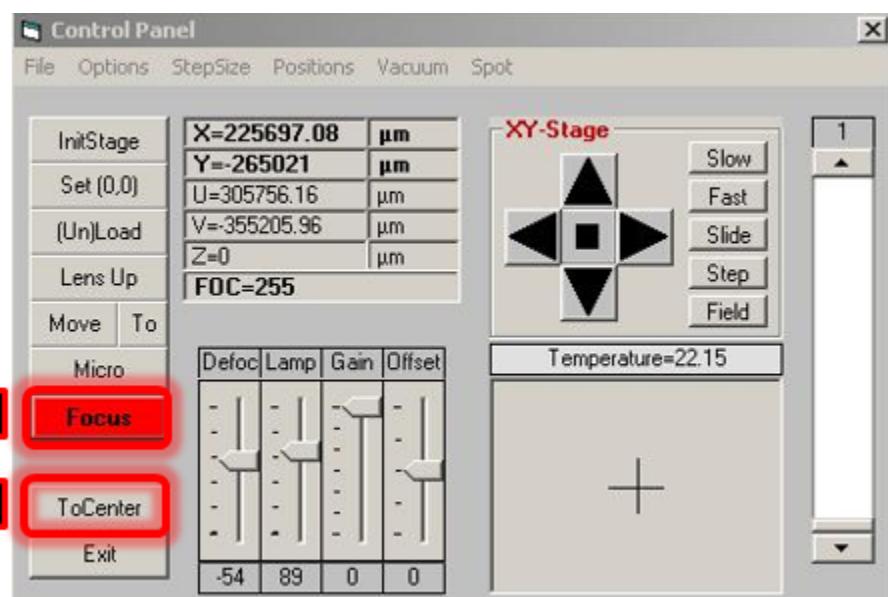
Do not change the highlighted fields. Number of Rows and Columns values are 1, Field Width and Height values are 10000, and Field Zero value is 1.

8. In the **Control Panel** menu, click **To Center** button (step 1 in below figure).

DOOR MUST BE COMPLETELY CLOSED FOR THE STAGE TO MOVE.

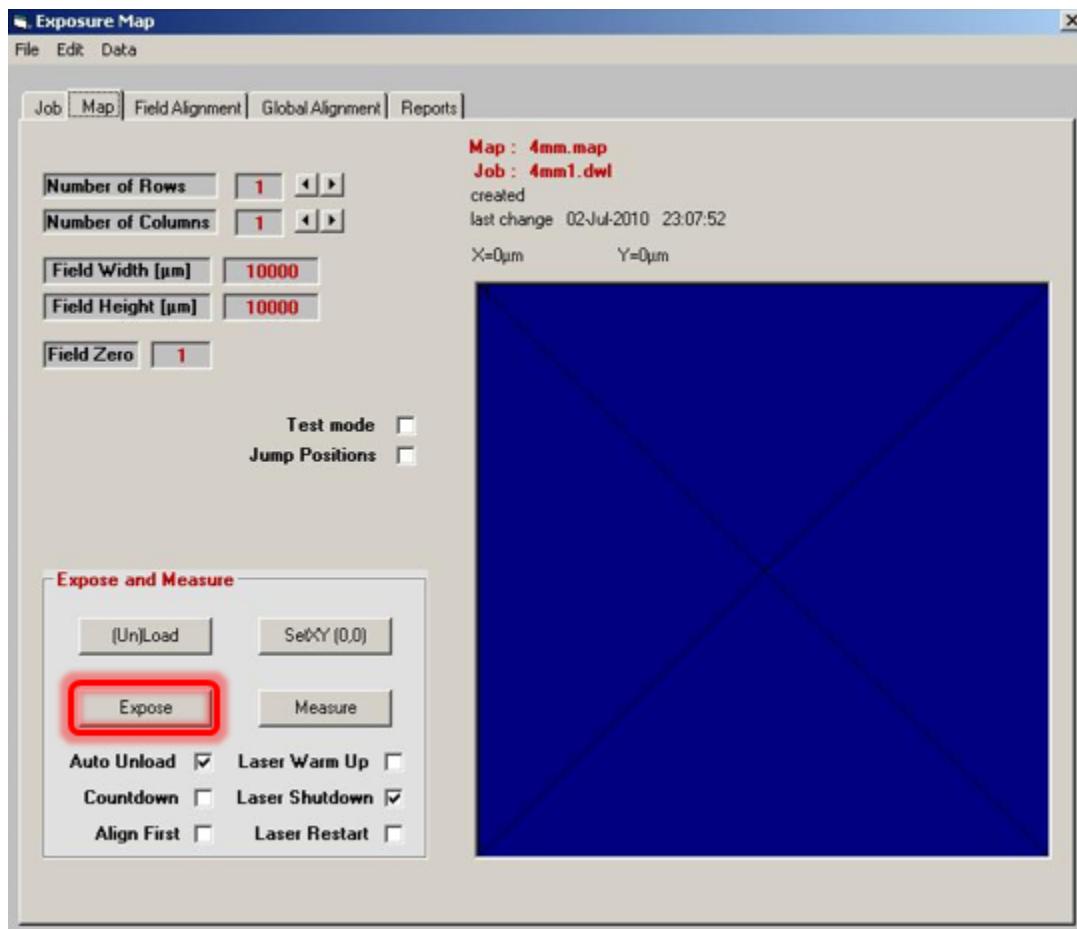
BEFORE FOCUSING - IMPORTANT NOTE: Check visually with the door closed that the mask is positioned under the lens. IF the mask is underneath the lens, click **Focus** (step 2). (If not, try **To Center** again.) A menu will pop-up indicating **Stage will move to Center Position and focus!**, the mask should already be at the center. Click **OK**. Focus will complete and no acknowledgement will appear.

If the stage does not move to the center, contact staff.

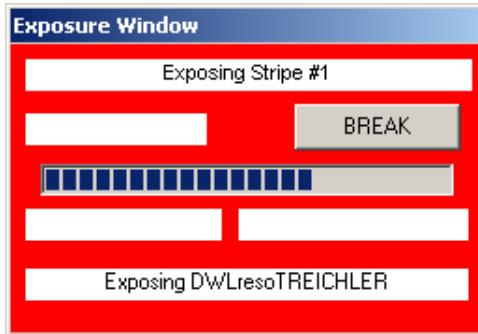


After Focus completes, click the highlighted icon . The stage will move and find the mask edges. Click **OK** within the popup menu that shows mask dimensions.

9. Click **Expose** in the **Exposure Map** window. You may see a popup window asking if you want to run Charm; click NO. The chamber door will lock and exposure will initiate. If the pattern is complex, the initiation time could take a while; however, for most patterns the exposure will start almost immediately or within a few minutes.



During writing, the window that shows stripe counts also displays an estimated time to completion. Unfortunately, this time is inaccurate for most patterns until well into the exposure process.



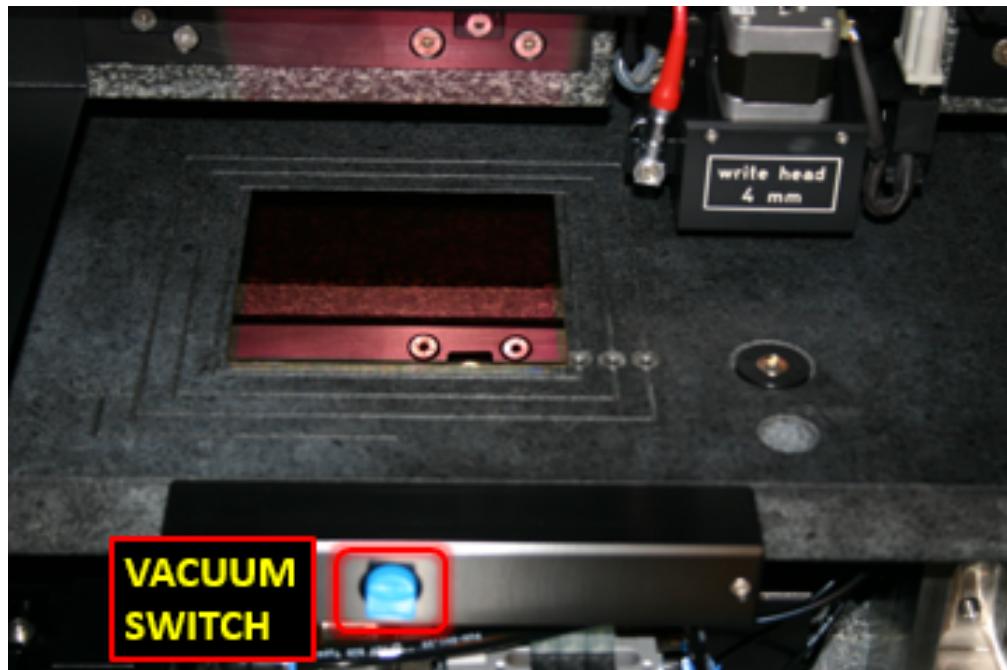
Upon completion, a box will appear with a green check mark. Click on the check mark to end the job. The chamber door will unlock.



The stage will automatically move to the load/unload position (since the **Auto Unload** option was checked in the previous section). If the stage does not move to the load/unload position, or you forgot to activate the **Auto Unload** option, click **(Un)Load** button within the **Exposure Map** window.

NOTE: Tool will NOT move to the load/unload position if the main chamber door is open.

10. The tool will appear in the following manner with the write head away from the mask plate. Release vacuum and take the mask off the stage. Close the main chamber door.



If the system is not in the above configuration, **DO NOT** attempt to unload a mask plate when the plate is underneath the write head. Removing the mask plate when it's directly underneath the write head could cause major damage to the write head. If the plate is underneath the write head, close the main chamber door, wait until it's fully closed, then click **(Un)Load** in the **Exposure Map** window.

WHEN FINISHED MAKE SURE THAT THE LASER IS OFF!!

LOG OUT OF NEMO.

Use the Hamatech Process 2 to develop, then inspect; then use Process 1 to etch the Cr, then inspect; then strip resist in the Hot Strip Bath.

Version 1.0 July 2010, following install.

Version 1.1 May 2011, following software changes - focus dilemmas resolved, laser shutdown status software bug was introduced.

Version 1.12 October 2013, major changes to the conversion section - new conversion computer. All images (both sections) updated.

Version 1.2 December 2019, minor changes to the conversion section, new laser operation. A few images (both sections) updated.

Version 1.21 April 2020, minor changes throughout. Both sections updated.

Version 1.22 January 2026, minor graphic changes throughout. Mask loading section relocated.