

University of Minnesota Nano Fabrication Center

Standard Operating Procedure

Equipment Name: maba6: Front to back align

Coral Name: maba6

Revision Number: 2

Model:

Revisionist: S. Miller

Location: Bay 2

Date: 2/1/07

1 Description

The maba6 is a contact aligner that uses 5 inch mask plates and can expose 4 inch wafers or pieces. It can do front side alignment, front to back alignment, and wafer to wafer alignment for wafer bonding. The SOP will cover front to back alignment. **This SOP assumes you have read and understood the front-side align SOP for the ma6 and maba6.**

2 Safety

- a Do not look directly at the ultraviolet light or its reflection.
- b Beware of all moving parts of the aligner. The microscope assembly moves up and down. The exposure tool will move forward when exposing a wafer. Be careful to avoid putting any body part, clothing, or other material in the path of the moving parts.

3 Restrictions/Requirements

- a Do not place heavy or sharp objects on the touch panel.
- b Do not lean on the anti-vibration table.
- c Do not turn any knobs more than a few degrees at a time. Turn all knobs with care. Handle all equipment gently and with care.
- d Do not use acetone to clean the chuck. If needed, use a towel with some IPA or methanol on it.
- e The piece chuck must be replaced in the cabinet after each use.
- f When handling the mask plate take care not to touch the proximity flags.
- g Enable the aligner in CORAL with each use.

4 Required Facilities

- a Compressed air
- b Vacuum
- c Nitrogen gas
- d Electrical Power

5 Definitions

6 Setup

- a Enable the aligner in CORAL.
- b Verify the Illumination switch is set to **BSA**.

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c **Mask Loading:**

- i If the mask holder is already out of the aligner go to iv.
- ii Press the **CHANGE MASK** key.
- iii Gently pull the mask holder out taking care not to hold the proximity flags. Place the mask holder upside down on the loading tray to the left of the machine.
- iv Place the mask on the mask holder (chrome side up) and align mask position against the fixed plate and positioning pin. Press **ENTER** to turn the vacuum on. Press the locking device in.
- v Turn the mask holder upright and push it all the way into the guide of the alignment stage. Clamp the mask holder in the alignment stage by pressing the **CHANGE MASK** key again.

d **Selecting and editing a Program**

- i Press the **SELECT PROGRAM** key to choose an exposure program. It will toggle through all 5 choices of programs.
- ii To edit a program, press the **EDIT PARAMETER** key. The adjustable parameters can be changed by using the Y arrow keys. Increase/decrease the selected parameter by pressing the Y key either up or down. . Toggle through the parameters by pressing the X key.
- iii Press the **EDIT PARAMETER** key again to save the recipe.

7 **Operating Instruction**

- i Press the **BSA MICROSCOPE** button to actuate the bottom microscope. The **TOP/BOTTOM** light will come on indicating that the cameras are focused onto the top substrate (the mask). Adjust the backside illumination with the corresponding knobs for the left or right cameras. Magnification can be adjustment by flipping the Magnification switch from low to high.
- ii Locate the mask alignment marks using the X and Y buttons on the touchpad. The two cameras can move together by pressing the **BOTH** button. They can move independently but pressing either the **LEFT** or **RIGHT** button.

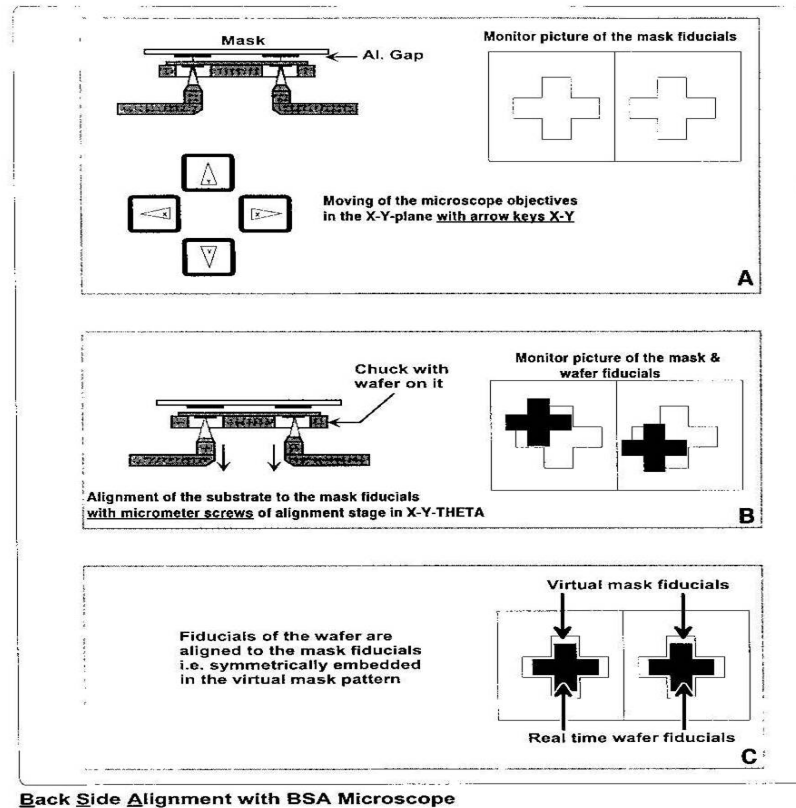
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- iii The focus can be adjusted by adjusting the top substrate focus knobs. Turn knobs SLIGHTLY (no more than a quarter of a turn) then allow the picture to come into focus. Continue with the slight adjustments until the alignment marks are in focus.
- iv Store the picture of the alignment marks by pressing the GRAB IMAGE button. The screen will indicate IMAGE STORED when it is finished. The cameras will then automatically focus on the wafer plane. The TOP/BOTTOM button light will go off to indicate the cameras are focused on the bottom substrate (the wafer).
- v Load the wafer. The pattern side goes faces down with the coated photoresist side facing up.
- vi Locate the alignments marks on the wafers using the micrometer screws X, Y, and theta. The focus can be adjusted by adjusting the bottom substrate focus knobs. Turn knobs SLIGHTLY (no more than a quarter of a turn) then allow the picture to come into focus. Continue with the slight adjustments until the alignment marks are in focus.
- vii Align wafer alignment marks with the alignment marks stored from the GRAB IMAGE. Below is a page from the manual describing the procedure.

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viii When alignment is complete press EXPOSURE.

b Unloading a wafer after exposure

i After the wafer has been exposed, pull the slide all the way out. Unload wafer and push the slide back into the machine. Press **ENTER** to confirm.

c Unloading a wafer Before Exposure

i To unload the wafer before exposure, press the **UNLOAD** key. Pull the slide all the way out. Unload wafer and push the slide back into the machine. The wafer is still being held by vacuum. Press **ENTER** to release the vacuum. Unload wafer and push the slide back into the machine.

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- d **Mask Unloading**
 - i Press the **CHANGE MASK** Key.
 - ii Place the mask holding upside down on the loading tray to the left of the machine. Press **ENTER** to turn the vacuum off. Take the mask out of the holder by pushing the locking device out.
 - iii Turn the mask holder upright and push it all the way into the guide of the alignment stage. Clamp the maskholder in the alignment stage by pressing the **CHANGE MASK** key again.
- e **Using the Piece Chuck**
 - i If the piece chuck is needed, **CAREFULLY** remove the 4 inch chuck and place it in the small cabinet to the left of the wafer bonder.
 - ii Remove the piece chuck (it is stored in the same cabinet), from its plastic wrap and place in the hole were the other chuck was located.
 - iii Plastic or Teflon coated tweezers are required to use the piece chuck to minimize any damage to the glass.
 - iv Align per normal procedures. The piece chuck can accommodate anywhere from a quarter of a wafer to one square centimeter piece.
 - v Return piece chuck to the cabinet inside the plastic wrap. Return 4 inch chuck to the aligner. Note in the log book that the piece chuck was used.
- f **Idle State**
 - i Clean up all wipes, notebooks, tweezers, and wafers.
 - ii Disable the aligner in CORAL.

8 Problems/Troubleshooting

- a **Mask features can not be focused.**
 - i The mask may be upside down. Reload mask correctly. The chrome (darker side) should be facing the wafer.
 - ii The mask may not be properly loaded onto the tray. Reload the Mask.
 - iii The mask may not be resting flush against the tray. Possible particle or photoresist is on the mask. Clean the mask and reload.
- b **Wafer is out of focus.**
 - i The alignment gap may be too large. Adjust with the **SEP** key.
 - ii The **WEC** may not have been done correctly. Unload the wafer and try again.
- c **Wafer sticks to the mask either before or after exposure.**
 - i If this occurs before exposure, increase the alignment gap. The mask should be cleaned before trying to expose another wafer.

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- ii If this occurs after exposure, either the mask may be dirty or the resist may not be baked enough.
- d **Loss of wafer vacuum.**
 - i The wafer may still be held with a vacuum. If so, continue with run.
 - ii If there is no vacuum, try cleaning the backside of the wafer or the chuck with methanol or IPA on a wipe.