Four Inch Anodic Wafer Bonding SOP

1. Scope

1.1 This document provides operating procedures for four inch anodic wafer bonding with the EVG 520.

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3. Reference Documents

3.1 Referenced within this Document

3.1.1 Bond Alignment SOP

3.2 External Documents

3.2.1 EVG 520IS Users Manual

4. Equipment and/or Materials

4.1 EVG 520

4.2 Si Wafer

4.3 Glass Wafer

4.4 Bond Glass

4.5 Electrode

4.6 Bond Chuck

4.7 Bond Chuck Removal Tool

5. Safety

5.1 Follow all Nanofab safety procedures.

5.2 Chuck will be hot after bonding. Use the bond chuck removal tool to move the chuck.

5.3 Maximum piston force for the quartz pressure plate used for anodic bonding is 5 kN during process and 2 kN during heating/cooling.

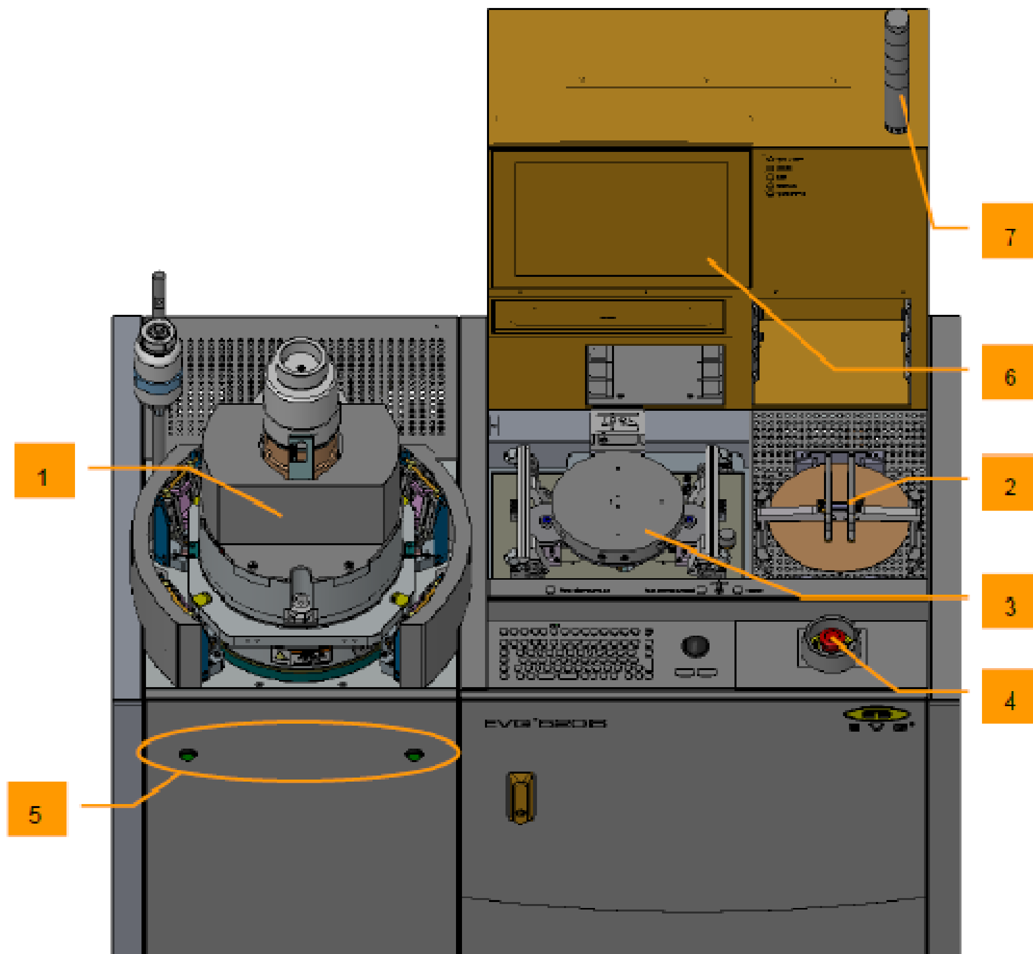


Figure 1, System Layout

1	Bond module
2	Buffer/Loading station (if equipped)
3	Cooling station (if equipped)
4	EMO button
5	Cover open/close button (if equipped)
6	PC Monitor
7	Signal lights

6. Setup Procedures

6.1 Record Information in Log Book

6.1.1 Record all requested setup and process information in the log book.

6.2 Login to EVG Software

6.2.1 If not already running, open EVG software.

6.2.2 If software is running, click login to login.

6.2.2.1 Enter username: labuser

6.2.2.2 Enter password: labuser

6.2.3 Go to Jobs to view current machine status.

6.2.3.1 Check temperature, if >30°C use bond chuck removal tool when moving the bond chuck to the cooling station.

7. Anodic Wafer Bonding Procedures

7.1 Load Bond Chuck

7.1.1 See *Bond Alignment SOP* for precise wafer alignment using the EV420 aligner.

7.1.2 Open chamber

7.1.2.1 Press and hold both chamber buttons simultaneously until lid is raised completely. See *Figure 1, System Layout*.

7.1.3 Ensure flange electrode, quartz insulation plate, and waferbow are installed. See *Figure 2, Top Plate*.

7.1.3.1 IF NOT, contact lab staff.

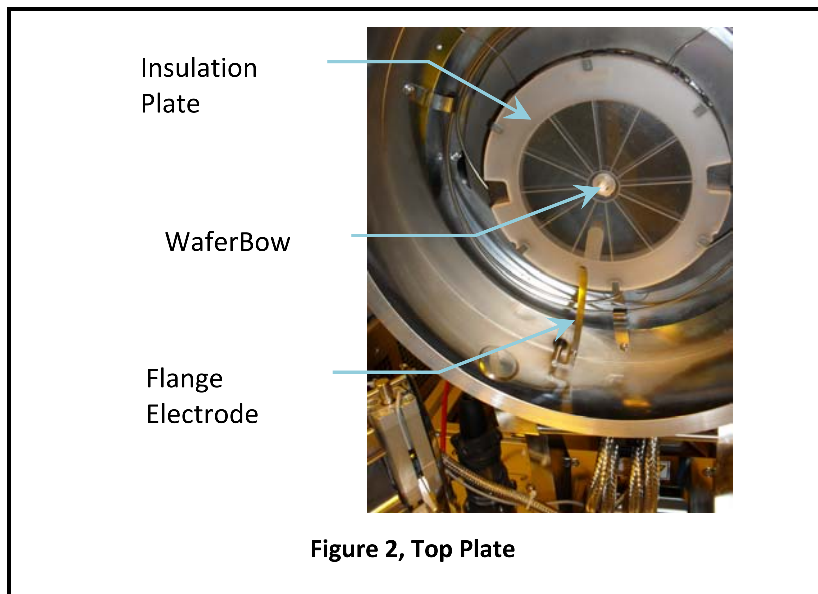


Figure 2, Top Plate

7.1.4 Remove bond chuck, place on cooling station. See *Figure 1, System Layout*.

7.1.5 Toggle switch to Unload. See *Figure 4, Tool Clamp Controls*.

7.1.6 Depress both tool clamp buttons simultaneously to clamp bond chuck. See *Figure 4*.

7.1.7 Measure the stack height.

7.1.7.1 Add the thicknesses of the glass wafer, silicon wafer, and graphite electrode to get the total stack height.

NOTE: The stack height is needed when setting the waferbow height.

7.1.8 Move out the flags (spacers).

7.1.9 Blow off the wafer with N2 to remove any particles.

7.1.10 Place Si wafer on bond chuck polished side up (side to be bonded up) with the wafer flat facing away from you.

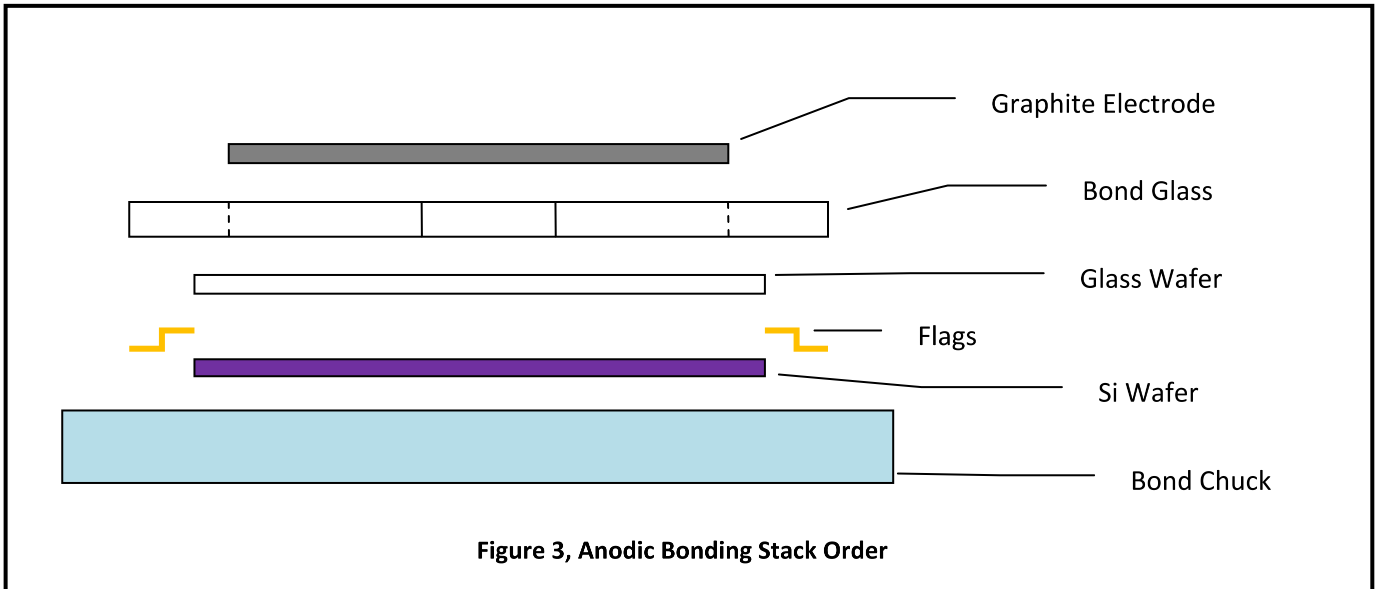


Figure 3, Anodic Bonding Stack Order

7.1.11 Move flags in. See *Figure 5, Loading the Bond Chuck*.

7.1.12 Place glass wafer on with the flats aligned.

7.1.13 Place bond glass on. See *Figure 6, Bond Chuck Clamps*.

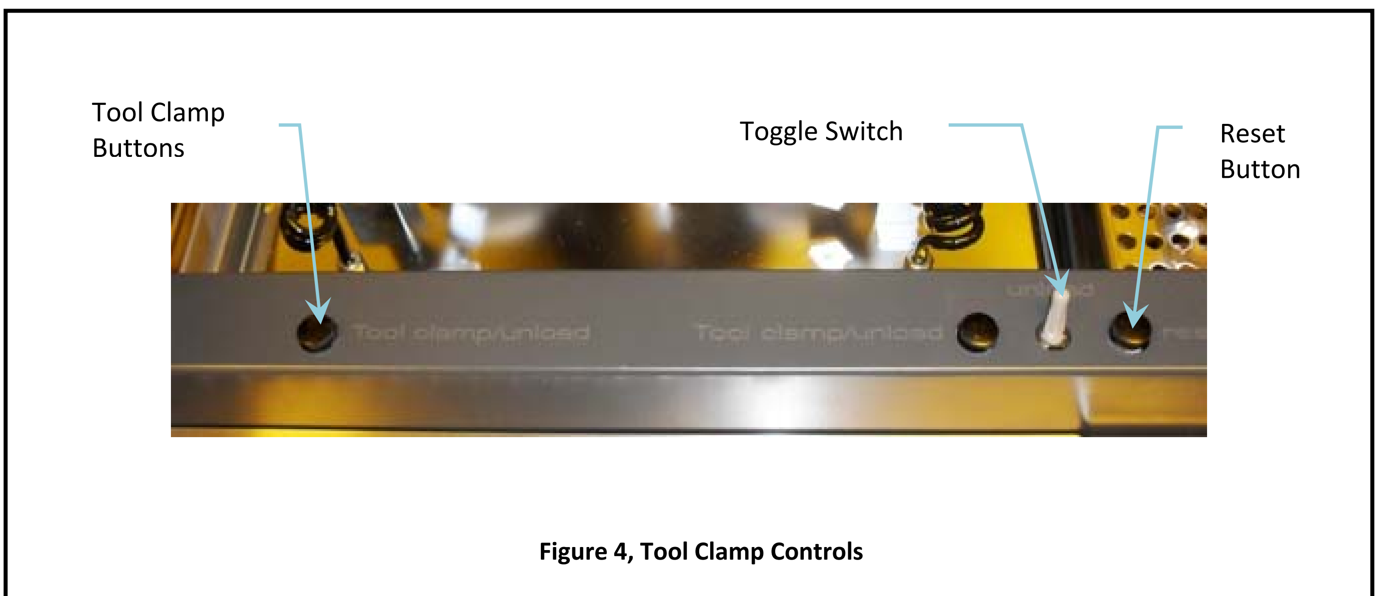


Figure 4, Tool Clamp Controls

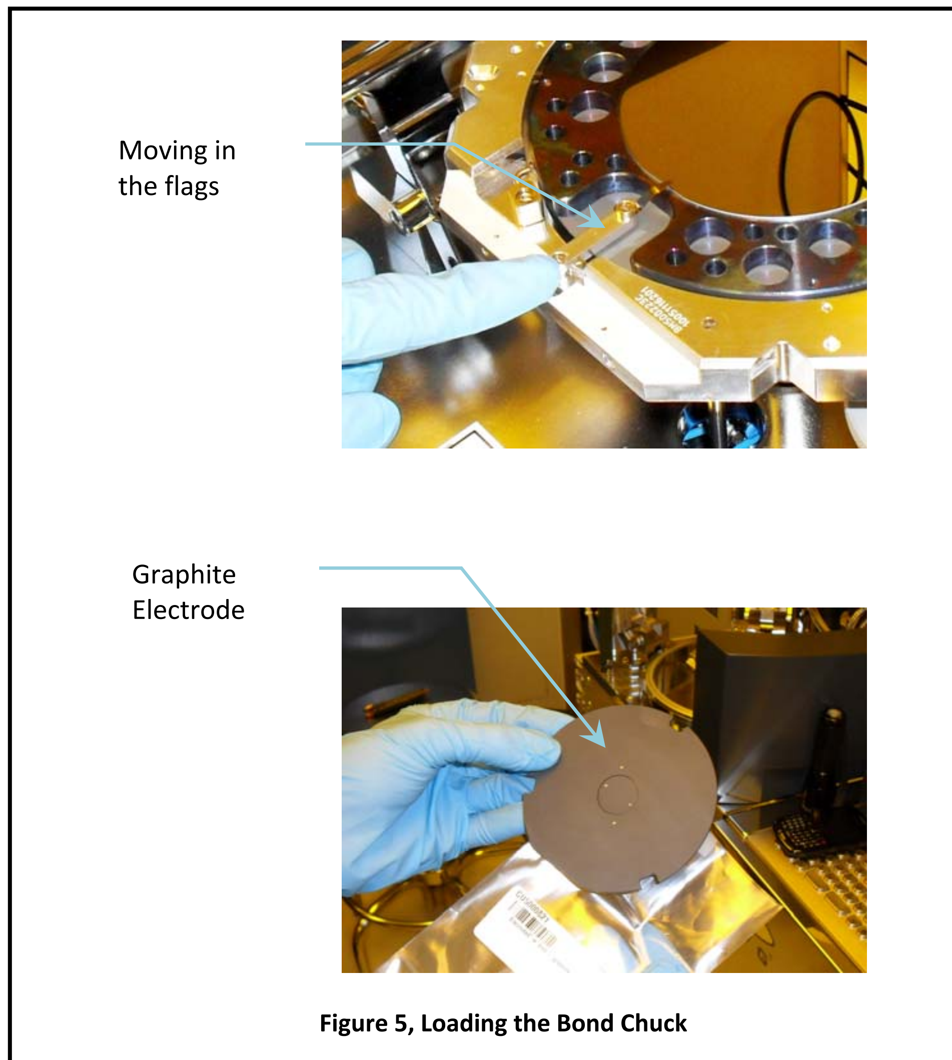


Figure 5, Loading the Bond Chuck

7.1.14 Rotate clamps inward. See *Figure 6, Bond Chuck Clamps*.

7.1.15 Press reset to set clamps. See *Figure 4, Tool Clamp Controls*.

7.1.16 Place the graphite electrode on. See *Figure 5, Loading the Bond Chuck*.

7.1.17 Place bond chuck in chamber.

7.1.18 Ensure that the chuck is situated correctly

7.1.19 Close the chamber

7.1.19.1 Press and hold both chamber buttons simultaneously until the lid is fully closed and clamped.

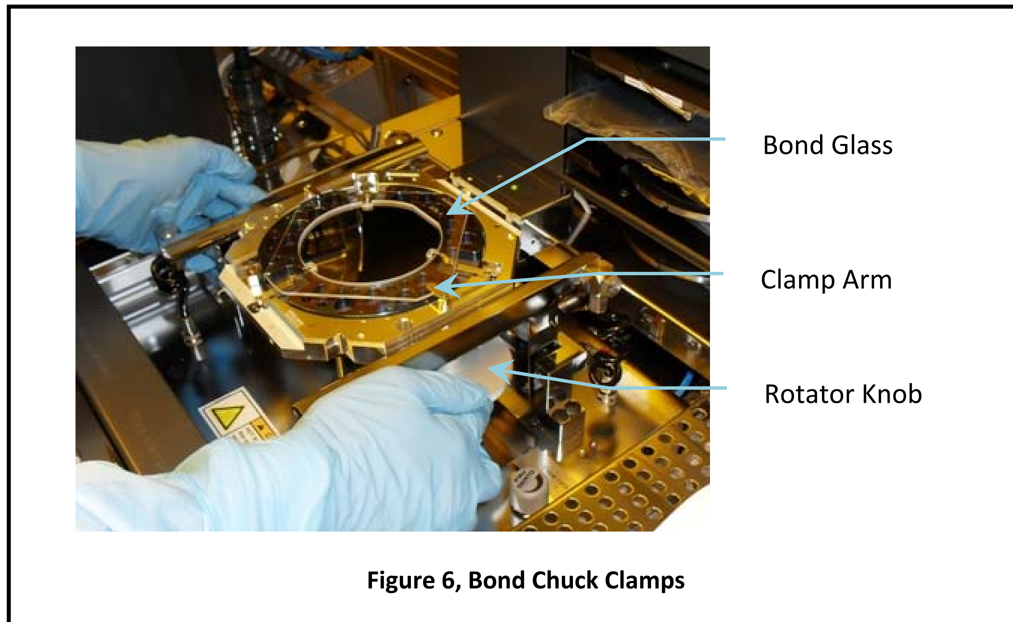


Figure 6, Bond Chuck Clamps

7.2 Set the Piston Height

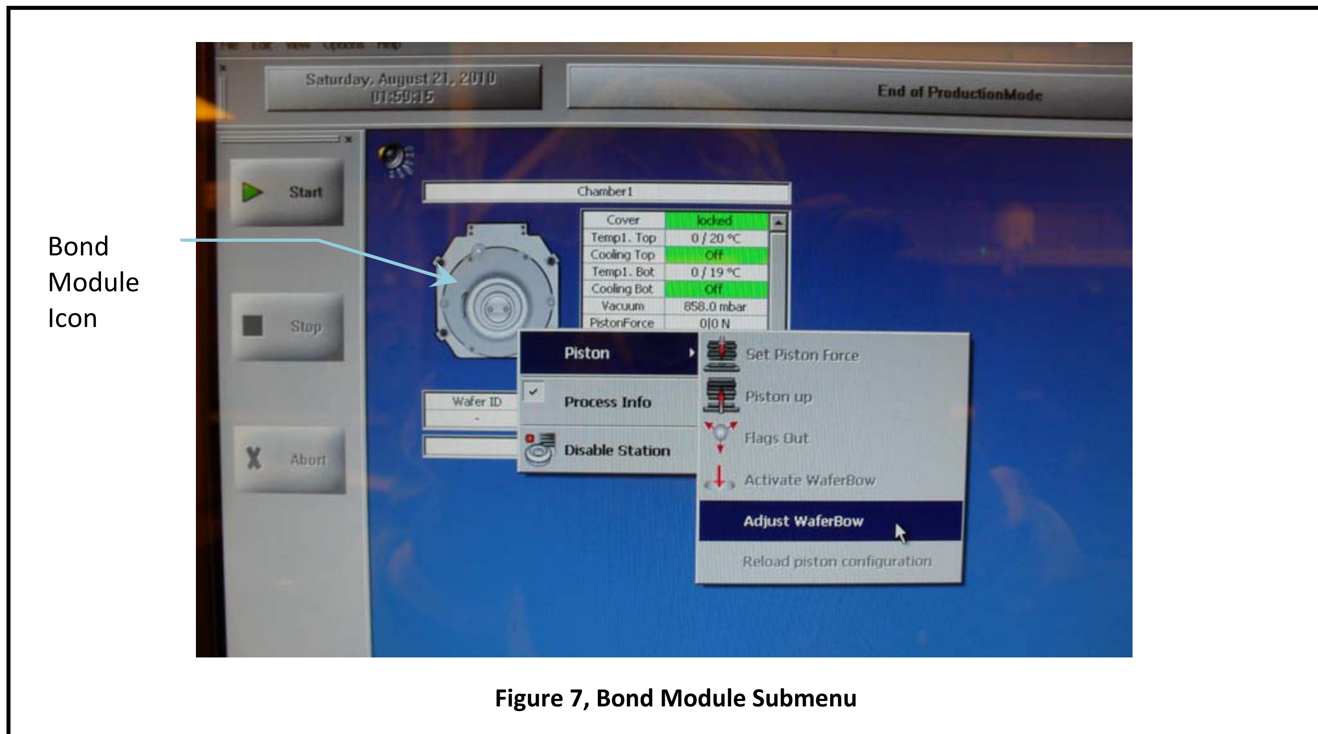


Figure 7, Bond Module Submenu

7.2.1 Click on the bond module icon to open the submenu. See *Figure 7, Bond Module Submenu*.

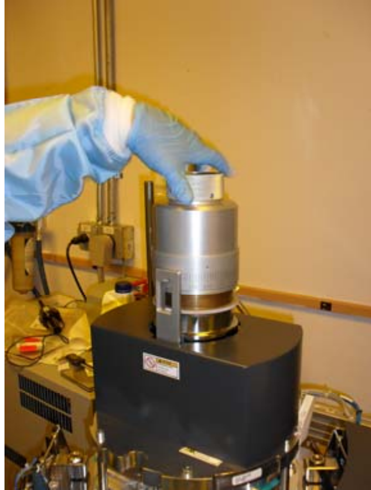
7.2.2 Go to Piston>Adjust WaferBow

7.2.3 Adjust knob to measured stack height. See Figure 8, Adjusting WaferBow

NOTE: Each full rotation of the knob = one millimeter. For example, from 0 rotate the knob four and half turns counter-clockwise for a stack height of 450 mils.

NOTE: The divisions on the plate are in mm and the divisions on the dial are in mils.

7.2.4 Click OK



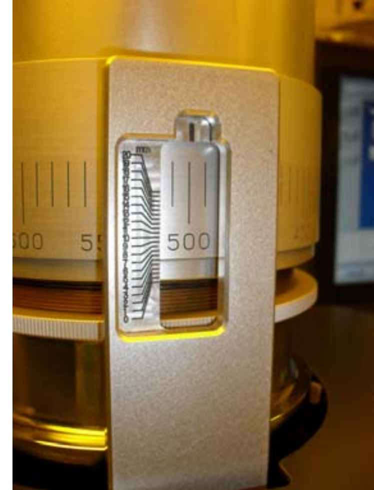


Figure 8, Adjusting WaferBow

7.3 Run the Recipe

7.3.1 Click Start

7.3.2 Enter lot #

7.3.3 Choose recipe from the drop down menu

7.3.3.1 Choose the negative recipe for the stack order shown in Figure 2 and Figure 7B.

7.3.3.2 Choose the positive recipe for the stack order shown in Figure 7A.

7.3.4 Click OK

7.3.5 Click OK

7.3.6 Open recorder

7.3.7 Wait for process to finish

7.4 Unload Chuck

7.4.1 Open chamber

7.4.2 Use the chuck removal tool to move chuck onto cooling station. See *Figure 9, Bond Chuck Removal Tool*.

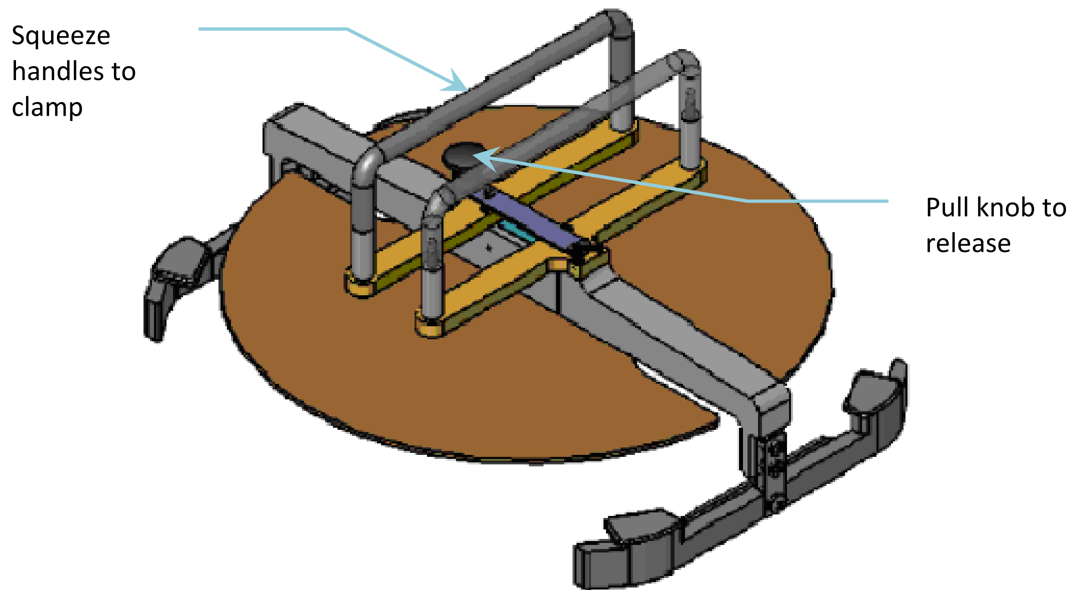


Figure 9, Bond Chuck Removal Tool

7.4.3 Press both clamp buttons to engage cooling station clamps

7.4.4 Let cool

NOTE: The light will turn green when the chuck is cool.

7.4.5 Rotate chuck clamps out

7.4.6 Remove electrode, bond glass, and bonded wafer stack

7.4.7 If running another process, load bond chuck as per ***7.1***.

7.4.8 If all processes are complete, go to *7.4.8.1*

7.4.8.1 Press Reset to release bond chuck

7.4.8.2 Place bond chuck in chamber

7.4.8.3 Close the chamber

7.4.8.4 Properly stow all parts

7.4.8.5 Click on tab to log out

8. Process Notes

8.1 2” Anodic Wafer Bonding

8.2 Triple Stack

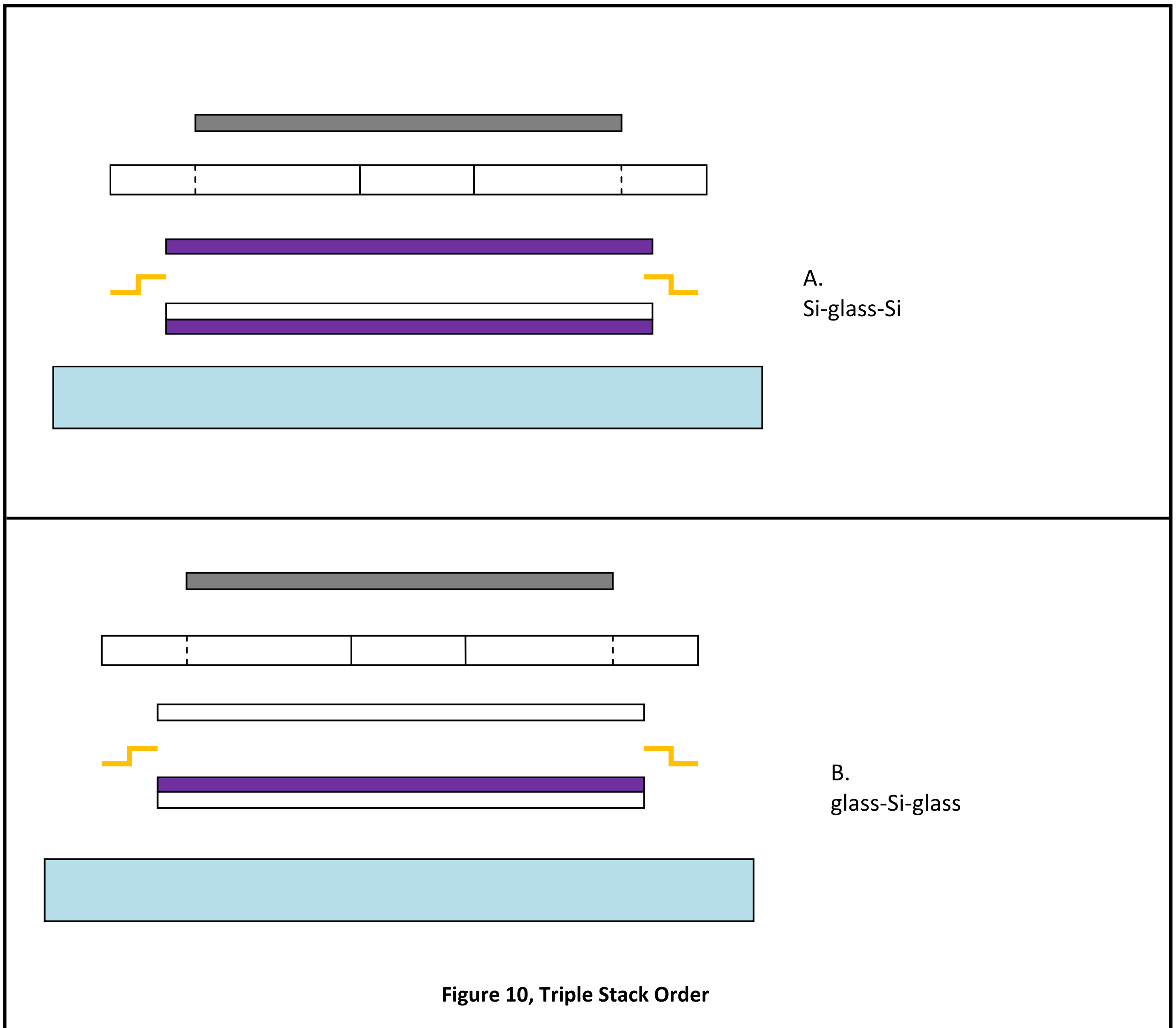


Figure 10, Triple Stack Order

9. Revision History

Rev	Date	Originator	Description of Changes
1	17 Aug 2010	Sam Bell	