

# CHA Mark 50 Evaporator

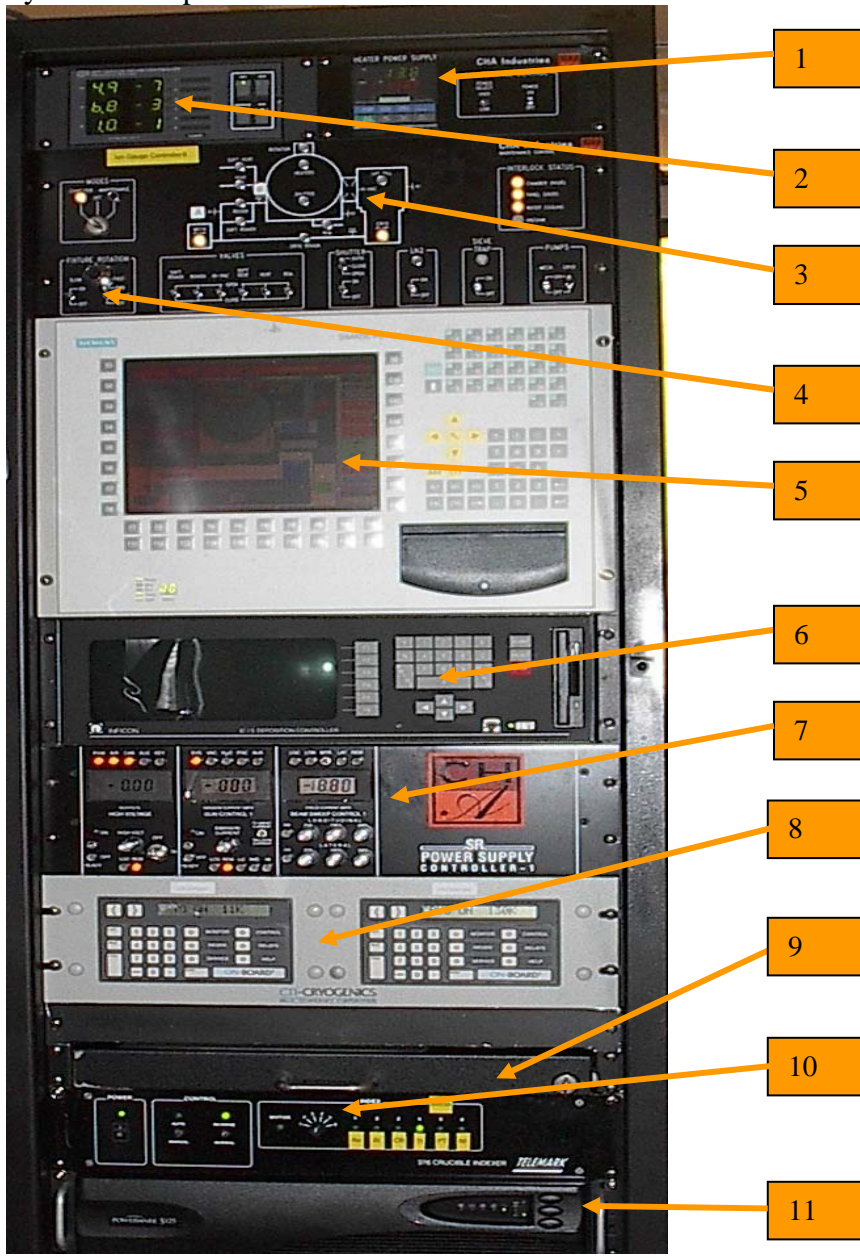
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The CHA Mark 50 Evaporator is a double stack cryo pumped, six pocket electron beam deposition system used to make uniform thin films. This is a rapid turn-around machine capable of handling 57 100mm and smaller substrates with a typical pump down time to  $5.0 \times 10^{-6}$  of 15 minutes. Both conformal and lift off configurations are available using individual crystal monitors with easy global planetary change out. It can deposit films up to 3.0 microns thick.

## General Instructions

- 1) No buddy system restrictions.
- 2) Only authorized materials may be evaporated. The list and process parameters are listed in Appendix A.
- 3) **Adjustments to the High Voltage, Filament Current, and Beam Sweep settings should be minimized.**
- 4) Do not touch anything on the Cryo (CTI) panel or the Powerware UPS unit.
- 5) Vacuum out chamber before use, and if depositing oxides, also when removing your samples.
- 6) If using biological materials, wipe down area with alcohol after you are done with your work.
- 7) When logging out of the tool, be sure to enter the material deposited and thickness in the remarks section of the log book. Gold and Platinum deposition requires additional Supplies Purchase when logging out.
- 8) Oxide depositions or Heated runs require separate training and require 24 hours advance notice.

## Systems Components Illustration



**Figure 1 - Front Panel Controls and Indicators**

- 1) Heater Temperature Controller - *should be set to 18°C.*
- 2) Granville-Phillips 307 Vacuum Gauge Controller
- 3) CHA Status and Maintenance Control Panel
- 4) Fixture Rotation Controller Knob - *Set to 140 which equals 7rpm.*
- 5) Siemens Simatec F125 Industrial Process Controller
- 6) Inficon IC/5 Thin Film Deposition Controller
- 7) CHA Power Supply Controller
  - 7.1) Eddy XYC-20 Digital E-Gun Sweep Controller
- 8) CTI Panel - *Cryo should be below 25°K, Pump should be below 125°K*
- 9) Keyboard and Drawer for mouse
- 10) Crucible Index Motor Knob
- 11) UPS

## General Operations

**Vacuum and Chamber functions** are controlled using the graphical function keys displayed on the Siemens Industrial Process Controller (Fig.1 - #5).

**The Inficon IC/5 unit** (Fig.1 - #6) controls the deposition process (i.e. deposition rate, target thickness etc.). The default process settings for each material are listed in Appendix A. Crystal Monitor #2 (in the center of the chamber) is kept covered EXCEPT when depositing using the Lift-Off dome feature - **Be sure to remove the cover before starting a lift-off process.**

**System In Standby.** When not in use, the CHA system is kept under vacuum and the “**System In Standby**” icon should be visible on the Siemens monitor (Fig.1 - #5). When finished with tool, pump down to a minimum of  $3.0 \times 10^{-2}$  before selecting icon “Standby” (F5). This takes less than 10 minutes following your run.

## Heater Power Supply

**DO NOT OPERATE CHA WITH HEATING WITHOUT SPECIAL NBTC STAFF TRAINING !**

The chamber temperature is upper number on the heater control display (#1 in Fig. 1). Reading is from a thermocouple located near the center of the chamber.

**PREHEAT ON** heats up to the controller setting then turns off. This is used for baking out the samples and chamber for critical runs.

**CONTINUOUS ON** runs at temperature controller setting until completion of run.

## PART 1 - Preparing the system before deposition

### 1. Make sure that the heater power supply is off

**Do not use the instrument with heating unless you have special training by NBTC staff.**

- Click on the “SYSTEM IN STANDBY” button on the PC screen to deactivate standby mode.
- Click on the “RECIPES” button
- Click on “SYSTEM PARAMETER SETTINGS” button
- Check “HEATER PARAMETERS”. The “**Preheat**” and “**Continuous**” buttons should be **RED**. The “**Heater Power HIGH/LOW**” icon will always remain **GREEN**.
- Click the “**DONE**” buttons to get back the main screen.

### 2. IC/5 process set-up:

To navigate the IC/5 screen, use the up or down arrows underneath the IC/5 keypad. Use “E” on keypad to confirm entered values. Certain pages will require keying “Page Forward or Page Back” function buttons.

The Inficon IC/5 screen (#6 in Fig. 1), should be at the “Process Directory” page when you start. If not, press “Program” <F6>, then “Process Directory” <F2>. There you can see the following processes listed:

#### **Conformal Deposition (use the rotating planetary system)**

- 1) Process 1 - **Aluminum** (NOTE: **Al** in Crucible Pocket #2)
- 2) Process 2 - **Gold** (NOTE: **Au** in Crucible Pocket #1)
- 3) Process 3 - Chrome
- 4) Process 4 - Titanium
- 5) Process 5 - Platinum
- 6) Process 6 - Nickel
- 7) Process 7 - Copper- Use Crucible Pocket 5
- 8) Process 8 - Silicon - Use Crucible Pocket 5
- 9) Process 9 - Silicon Dioxide - Use Crucible Pocket 5
- 10) Process 10 - Silicon Dioxide - *DON'T USE THIS ONE - EXTRA PROCESS*

#### **Lift Off Deposition (use the lift-off dome with uniformity shield)**

- 11) Process 11 - **Aluminum** (NOTE: **Al** in Crucible Pocket #2)
  - 12) Process 12 - **Gold** (NOTE: **Au** in Crucible Pocket #1)
  - 13) Process 13 - Chrome
  - 14) Process 14 - Titanium
  - 15) Process 15 - Platinum
  - 16) Process 16 - Nickel
- (continued next page)

- 17) Process **17** – Copper- Use Crucible Pocket 5
- 18) Process **18** - Si- Use Crucible Pocket 5
- 19) Process **19** – Silicon Dioxide - Use Crucible Pocket 5

See Appendix A for a complete listing of the parameters used for each process.

**Select the process number** for the material you want to deposit with the up/down arrows. Processes are listed numerically; use the **Page Forward/Page Back <F1/F2>** function buttons to get to more pages of Process numbers. After selection, press **“Process<F5>”**.

*The Process screen will appear. Each required process parameter has been preprogrammed apart from the **rate, final thickness, and thickness limit** values. 0.5-3 Angstrom/sec are typical values for the rate.*

**Change the rate, final thickness, and thickness limit** values if needed. Scroll down using the keypad arrows and enter your parameters. Confirm each value with the **“Enter” <E>** key.

Press **“Process Directory” <F6>** to return to the Process Directory.

**Highlight** your process with the arrow keys.

Press **“Select Active Process” <F4>**.

Press **“Program” <F6>**.

Press **“Operate” <F6>** to continue - The Process screen will appear.

Press **“Zero Thickness”<F1>**.

**Check crystal life.**

To do this, press **“Sensors” <F2>**. The **“LIFE”** column for **Crystal’s** represents the amount of crystal life consumed. If over 20 %, it is best to change the crystal. *If you need to change the crystal, do this later when the chamber is open.*

The; **“ACT”** (activity) column, is a measure of the sensor’s “health” or ability to conduct current. The values range from 650 (maximum) to 0. Consider changing the crystal when the value falls below 400. *If you need to change the crystal, do this later when the chamber is open.*

**Return to the Operating screen** by pressing **Operate<F6>**.

**Note:** *The system is configured to continue deposition with **Time/Power** in the event of a crystal failure (This means the system will calculate the time needed to reach your target thickness from the time of failure based on the current deposition rate.) Do not make any e-beam adjustments if this occurs. Ti,Cr,SiO<sub>2</sub> are not configured for this.*

**Select the correct pocket** on the **Crucible Indexer** (Fig. 1 #10) so it matches the metal you are evaporating.

## **Part 2 - Preparing the chamber for deposition run**

### **1. Open the chamber**

**Have your samples ready!!**

**On the Siemens Process Controller** (Fig. 1 - #5) use the mouse to click the “**Vent**” **<F4>** icon in order to vent the chamber.

**After chamber is vented**, grab both door handles, and pull out and down to lower the chamber door. The nitrogen purge will stop. After lowering the chamber door, stow door vertically, use the mouse to click on the “**System in Standby**” icon.

Click on the “**Chamber Door Is Not Closed**” icon (repeat if icon pops-up again)

Click on “**Password**” **<F11>** and a keyboard will come up on screen. Use the mouse and click the letter “**m**” and then **Enter** to enable manual operation.

The **Password<F11>** box will become green.

Click the **Manual <F10>** box above it and it becomes green.

*Now you can manually manipulate operations on the Siemens PC Screen using the mouse cursor or associated function keys, including rotating the substrate holders, opening the shutter, etc.*

If using the Lift-Off processes, make sure to uncover Crystal #2.

If you want to run a process using the **rotating planetary system**, see the “**CHA Mark 50 planetary track-guided system installation Procedure**” on page 14 if it is not installed already.

If you want to run a process using the **lift-off dome**, see the “**CHA Mark 50 Lift-off Dome Installation Procedure**” on page 11 if it is not installed already.

## 2. Mount samples

**Place wafer(s)** in the 4" holders. **Use at least 2 retaining clips** for each wafer (no clips needed for lift-off dome). There are 4" Stainless Steel wafers for mounting odd sized samples or for backing plates to prevent deposition on the back of samples.

**Use only Kapton tape** to mount odd sized substrates onto backing plates.

**If** you need to rotate the planetary substrate holders to mount samples, press the "motor" icon on the PC using the mouse. The motor icon changes to green, and the holders start rotating (might be a slow response time), click icon again to stop movement.

**Lift off samples** – Use 12 outer ring sample holders only. The inner 7 slots are not calibrated.

## 3. Check material levels in the pockets

### **Check material level.**

Open the shutter using the icon on the PC screen and check the level of the metal(s) you want to deposit. If the pocket is less than half full, add metal to 2/3 full (1/4 inch from top). *Do this for all materials of interest if you plan to deposit multiple layers without breaking vacuum.* Close shutter by clicking shutter icon.

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**Important:** This section is for gold deposition instructions. Gold uses a crucible liner which improves melting and evaporation quality. It is very temperature dependent and the weight of the gold in the crucible influences the rate of melt and evaporation. Inadequate starting weight will cause much faster, runaway melting and evaporation rates.

The settings listed in Appendix A for the two soak and ramp periods are based on a starting weight of 190 grams (crucible + gold). Following these guidelines will give you a starting rate of approximately 0.8 Angstroms per second. The IC/5 corrects the power setting to get to your rate setting after the shutter opens.

1. Use the **Gold Evaporation Log Book** located in the front pocket of the tool manual.
2. With clean gloves, remove crucible liner and weigh it using the scale on the PDMS bench. The liner may contain pellets, use care in removing and weighing.
3. Record weight of crucible+metal in log. The weight should be higher than 180 grams.

4. Add gold so the crucible+gold weighs ~190 grams. Record exact starting weight in log. Gold is stored in the materials box on cart next to the CHA.  
FYI: Each 500 Angstroms of gold to be deposited use approximately 1 gram of metal (amount of material used in the soak is ~1g).  
**The total crucible weight should never go below 180 grams at any one point during a run!**
5. Return crucible to pocket and ensure it is fully seated.
6. Continue with your run as described below.
7. When your run is finished and the chamber and crucible has cooled down for ~5 min, use clean gloves as in step 2, record the total weight in the log.
8. Return crucible to pocket and ensure it is fully seated.

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**Check alignment of pocket**, if it is not close to being centered, contact a staff member.

**Check the placement** of the **wafer mirror** in the rear of the chamber. This is used to view pocket during deposition, and should be adjusted as necessary.

**If necessary**, change the crystal at this time.

**Vacuum the chamber** with house vacuum system. **Replace** the glass slides that cover the viewing port.

When finished with all manual operations in the chamber, click "**Auto**" <F9> icon.

**Lift and push** the chamber door closed. Avoid jarring the front panels.

**Click Pumpdown** <F3> on the PC screen while pushing against the chamber door to be sure it seals and the interlock engages. Hold door until "soft rough" switches to "rough" on PC screen.

## Part 3 - Start the deposition run

### 1. Set up the Digital E-Gun Sweep

***Note:** The instrument takes some time to register each command. Wait 1-2 seconds after each command and make sure your selection went through. Be patient.*

**Press the blue "POWER" button** on the lower left hand side of the instrument. The light should come on, and the screen should come up after about 5 seconds. A menu should show up. The sweep pattern is shown on the right hand side and the program parameters on the left.

### **Check the parameters.**

Status: Sweeping

Pocket: A (This feature is NOT used by our system)

E-Gun: 1kV (This feature is NOT used by our system)

Material: Dependent on previous user's program—Al, Au, Cr, Ti, Pt, Ni, Cu, Si, SiO<sub>2</sub> available.

Rate: 6.0 Hz (Use the “**INC+**” or “**DEC-**” buttons to adjust this value)

The pattern on the right hand side should be a smaller circle centered on a larger circle.

If the material listed on the parameters matches the material you want to use, no further steps are needed.

If the material listed on the parameters does not match the material you want to use, change the material using the following method:

**Press and hold down** the “PROGRAM” button for about one second. In several seconds, the “Pattern” parameter will be highlighted.

When the “Pattern” parameter number is highlighted, **press “PROGRAM” again**. After about 5 seconds, a new menu will pop up.

**Press the “INC+” or “DEC-” buttons** until the appropriate pattern and material are selected. It will take several second for the instrument to respond to each instruction, wait until the entire screen shows up before pressing another button. The patterns are as follows: 1:Al 2:Au 3:Cr 4:Ti 5:Pt 6:Ni

When the correct material has been selected, **press “RUN” to select it**. After about 5 seconds, you will be returned to the initial screen.

**Verify that all of the parameters are correct, as previously.** The material should be the one you will be using. The status should still be “SWEEPING” and the circle pattern should still be centered.

## **2. Prepare a run**

**On the Siemens Process Controller** (Fig. 1 - #5)

To start the run, click the “**Auto**” <F9> and then the “**Automatic**” <F1> button on the PC screen. The system will ask you for the IC/5 process you want to run. Select the IC/5 process number you have configured earlier and then click **OK**.

**Please check that the IC5, the XYC-20, and the Crucible pocket are all set to the same material.**

If an icon appears that asks if you want to **Continue with Current Layer** or **Reset IC5 and Deposit New Layer** <F8>, click on **Reset IC5 and Deposit New Layer** <F8>.

The process starts and will be controlled by the Inficon IC/5. All gun controls are preset and should not be adjusted, except for the values below:

High Voltage kV is set at -7.95 to -8.05 kV. – *Wait for the value to stabilize, if it is not within these limits, adjust HV knob slowly until it is.*

Filament current is preset – Do NOT change.

Beam Sweep Control is now controlled by the XYC-20.

**If anything seems out of the ordinary, abort the run “Abort”<F12> and contact an NBTC staff member immediately (Typically, we can resume your run after an Abort without venting the chamber).**

NOTE:When Vacuum Gauge “B” pumps down to approx  $5.0 \times 10^{-2}$  the “Rough Valve” will close and the “HiVac Valve” will open. When gauge IG2 pumps down to  $5 \times 10^{-6}$ , it will show a “**Pumpdown Complete**” screen message. The system will continue to pump on the chamber.

## **Part 4 - Multiple films, or end of run.**

**When the run is finished** the PC screen show a prompt that says “**Press Abort <F12> To Go In Standby Do You Want To Vent? YES<F9>**”.

You have two options:

### **A. Run an additional process**

If you want to start another process without breaking the vacuum (i.e. the Au layer in a Cr/Au deposition), press the “**Abort**”<F12> button. Set-up your next IC5 process as in **Part 1**, select the correct pocket, and set the XYC-20; and then start the run by pressing the “**Automatic**“ <F1> button as in **Part 3**, then press F7.

### **B. Take out your samples**

When you have finished all you run(s), wait at least 3 minutes for chamber, crucible liner, and substrates to cool, then press the “**Abort**”<F12> button. Press **Vent<F4>** to vent the chamber to atmosphere.

When the chamber has vented, grab both handles on the door and pull out and lower chamber door.

**Click** on the “**System in Standby**” message after opening the chamber door.

**Click** on “**Chamber Door Is Open**” icon (repeat if needed).

**Click** on “**Password**” <F11> and a keyboard will come up on screen. Using the mouse click the letter “**m**” and then “**Enter**” to enable manual operation.

The **Password<F11>** box will become green.

Click the **Manual <F10>** box above it and it becomes green.

The Siemens PC Screen then changes to allow you to manipulate operations using the mouse cursor or associated function keys.

**Remove your samples** and clean up the chamber if necessary (rotate the holders with the PC screen control if needed).

If you have deposited gold (see full gold deposition instructions in part 2.3)

7. When your run is finished and the chamber and crucible has cooled down use clean gloves as in step 2, record the total weight of crucible in the log.

8. Return crucible to pocket and ensure it is fully seated

Replace **Crystal Monitor #2 foil cover** (if the lift-off dome is NOT installed)

**Close** the door and press **Auto<F9>** to return to normal operating mode.

Press **Pumpdown <F3>**, while holding the door closed. Hold door until completion of soft rough.

**Turn the XYC-20 OFF** by pressing the “POWER” button.

**At this point** you may log off the tool. Gold and Platinum deposition requires a “Supplies” entry after log-off.

**Return the Inficon IC/5** screen to the “**Process Directory**” page. To do this, press “**Program**” <F6>, then “**Process Directory**” <F2>.

Wait until the “**Pumpdown Complete**” message shows up (about 15 minutes), and then click the “**Standby**” <F5> icon on the PC screen.

**Do not leave the cryopump pumping on the chamber.**

**If you haven't done so yet – Log-off the tool.**

Note in the comment remarks what metals you used, and what thickness you deposited.

**Gold and Platinum** requires a “Supplies” entry in the log-on system. Enter the amount of gold you used in grams (Used gold = Start weight<sub>crucible+gold</sub> – End weight<sub>crucible+gold</sub>)

## **Part 5 CHA Mark 50 Lift-off Dome Installation Procedure**

The planetary lift-off dome or planetary track-guided substrate holders may be in place when you first open the chamber.

### **To mount lift-off dome:**

**Move** one planetary substrate holder (fig.2 - 12) to the front by rotating the planetary system manually by pressing the “motor” icon on the PC using the mouse. *OBS! The planetary speed knob (fig1. #4) should be set to 140.*

**Grab** the substrate holder and arm (fig2. - 12&13) and lift both straight up and out at the same time.

**Replace** the arm with a Lift-off dome arm (fig. 3 - 13a) and be sure the lift-off dome clamp (fig.3 - 14a) is facing in towards the chamber.

**Repeat** for all three holders.

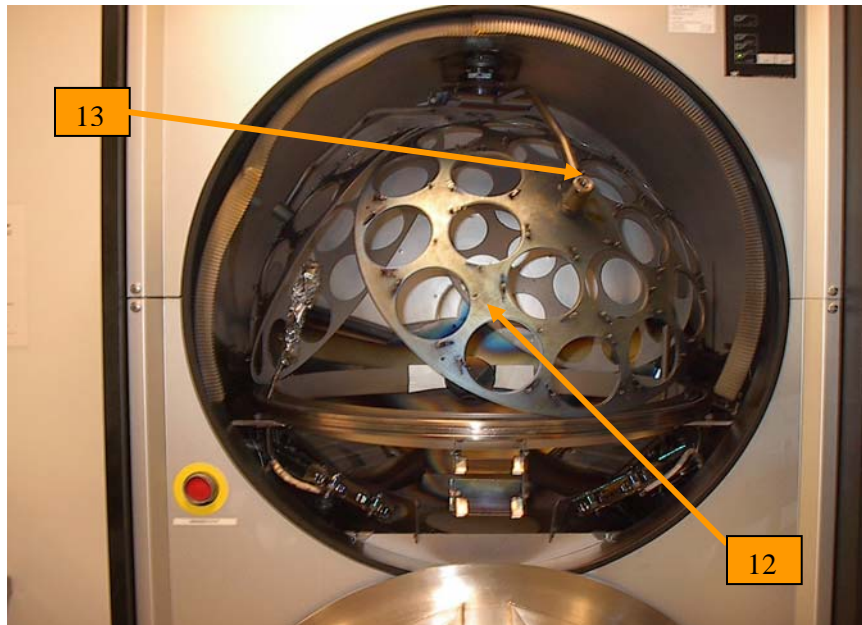


Figure 2

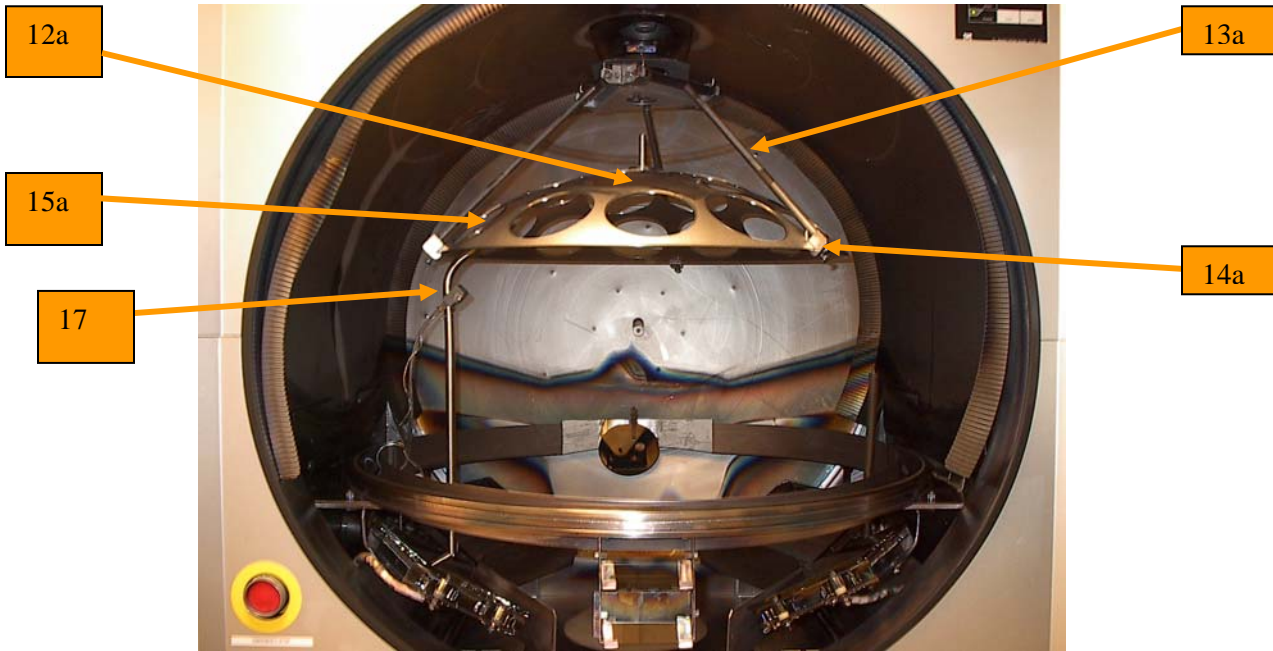


Figure 3

**Fit the lift-off dome** (fig3. - 12a) into the chamber as in figure 3 while taking care not to bump into the pocket mirror, or the lift-off crystal monitor. Position the arm clamps (fig3. - 14a) by aligning the pins as pictured below in figure 4.  
**NOTE: The pins must be on the left side of EACH arm clamp.**

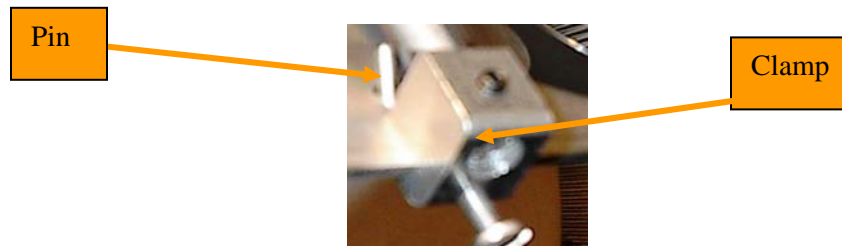


Figure 4

**Install Uniformity shield** (15a) as pictured below in figure 5. Ensure shield is aligned to premarked calibration groove and is parallel to the dome.

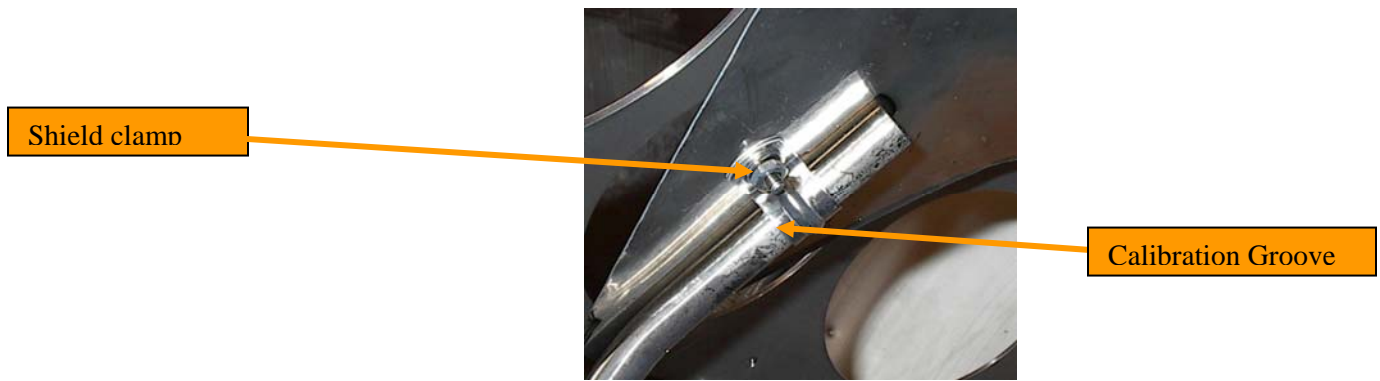


Figure 5

**Be sure the speed controller** is set to 140. Test the dome rotation by activating the motor on the PC display. If necessary adjust speed control to get 7 rpm.

**Remove cover on Crystal #2 (fig3 – 17).**

**Mount samples** in the 12 outer positions. Inner positions are currently not available. Use a 4" steel wafer to mount samples if necessary.

**Check** the pocket mirror, and **replace** porthole cover guards (microscope slides).

## Part 6 CHA Mark 50 planetary track-guided system installation procedure

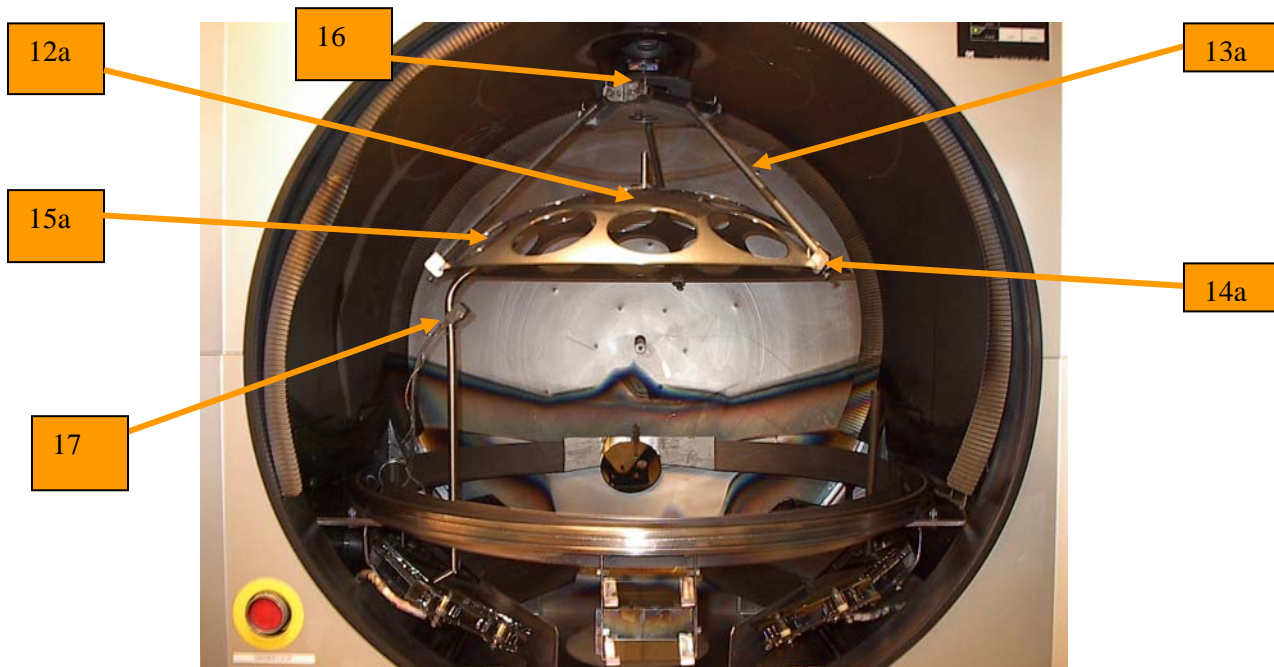


Figure 6

**Remove** the uniformity shield (fig6 – 15a).

**IMPORTANT:** Cover crystal sensor #2 (fig6 – 17).

**Remove the lift-off dome** (fig6. - 12a) while being careful not to bump into pocket mirror, or lift-off crystal monitor.

**Rotate the lift-off dome arms** by pressing the “motor” icon on the PC using the mouse until they are accessible. *Note! The planetary speed knob (fig1. #4) should be set to 140.*

**Remove arms** from the “T” lock by lifting each arm up and out.

**Move** one of the planetary substrate holder slots (fig7. - 16) to the front by rotating the planetary system using the motor icon on the PC screen.

**Grab** the planetary substrate holder and arm assembly (fig7. – 12&13) simultaneously and fit them into the T-lock holder from a raised position and then lower the substrate holder gently onto the circular track.

**Mount samples** in any open position. Use 4” steel wafers to mount samples if necessary.

**Be sure speed controller** (fig. 1 #4) is set to 140. Test planetary rotation by activating the motor on the PC display. Adjust speed control as necessary to get 7 rpm. Note! The holders must ride uniformly centered on the circular track. If not, make sure that the planetary bearings are pressed fully into the arms, or repeat the holder installation.

**Check** the pocket mirror, and **replace** the porthole cover guards (microscope slides). Use house vacuum cleaning as necessary.

**Check** the crystal status and mount your samples.

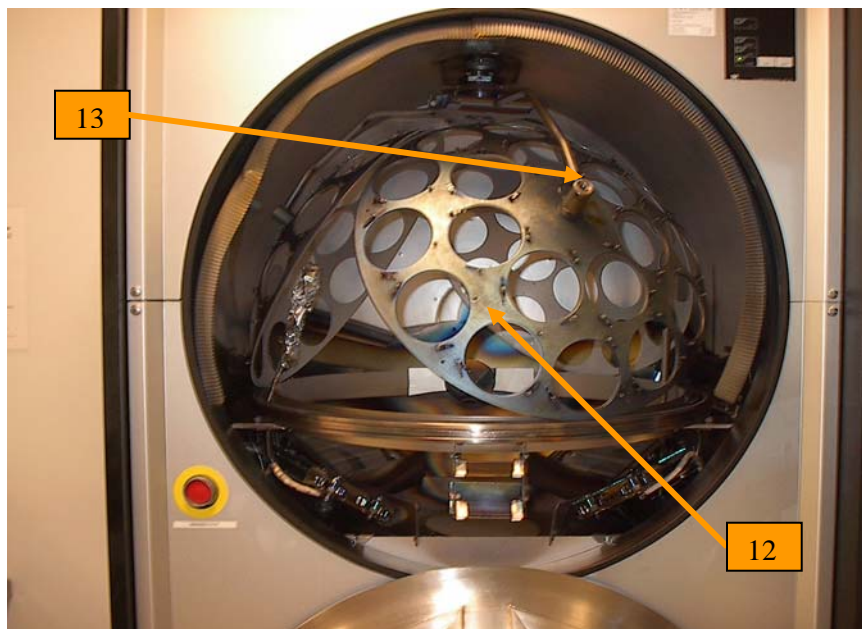


Figure 7

## **Part 7 Silicon Dioxide Evaporation Capability**

Technical assistance and additional training by a staff member are required for the first 3 runs by users. There is no additional charge for staff use.

24 hour advance notice to staff for SiO<sub>2</sub> depositions is required. This is best accomplished through the NBTC reservation system by specifying the material to be deposited in the "Note:" section on the reservation page.

3 SiO<sub>2</sub> discs are necessary for a single run regardless of the minimum goal thickness for your samples. This is required to avoid Al<sub>2</sub>O<sub>3</sub> crucible liner and/or hearth damage. Charge is \$15.00 per disc for a total "supplies" cost of \$45.00 per run. 1.0 micrometer of deposited film is possible per 3-disc run. The crucible liner may be reloaded by venting the chamber to atmosphere and adding another set of discs for additional thickness.

## **Part 8 – Set Up for SiO<sub>2</sub>**

For lift off processes the chamber walls need to be covered.

Obtain 4 28" long sheets of aluminum foil. Using 2 sheets on each sidewall of the chamber, tuck in foil edges and ensure foil is away from moving parts as shown in Figure 8.



Figure 8

Rotate pocket indexer to Platinum pocket.

Remove platinum charge, and place in Ziploc bag available at glove station.  
Wipe pocket with IPA soaked beta wipe.

Insert  $\text{Al}_2\text{O}_3$  crucible liner into pocket. Each  $\text{SiO}_2$  packet contains 2 1" and 1 ¾" disc, add discs, with smaller disc at bottom of liner.

**Check the placement** of the **wafer mirror** in the rear of the chamber. This is used to view pocket during deposition, and should be adjusted as necessary.

**If necessary**, change the crystal at this time.

**IC/5 setup:** Verify on the IC/5 that the silicon oxide materials properties are listed as  $2.2 \text{ g/cm}^3$ . A recommended start rate is 1.5 Angstrom/sec.

**Vacuum the chamber** with house vacuum system. **Replace** the glass slides that cover the viewing port.

Close shutter by clicking shutter icon.

Mount samples.

When finished with all manual operations in the chamber, click “**Auto**” <F9> icon above the green “**Manual**”. <F10> icon on the PC screen

**Lift and push** the chamber door closed. Avoid jarring the front panels.

## Part 9 – Starting the SiO<sub>2</sub> deposition run

Click **Pumpdown <F3>** on the PC screen while pushing against the chamber door to be sure it seals and the interlock engages. Hold door until “soft rough” switches to “rough” on PC screen.

Wait until the system pumps down to  $5 \times 10^{-6}$ , it will show a “**Pumpdown Complete**” screen message. The system will continue to pump on the chamber.

To start the run, click the “**Automatic**” **<F1>** button on the PC screen. The system will ask you for the IC/5 process you want to run. Select the IC/5 process number you have configured earlier and then click **OK**.

The process starts and will be controlled by the Inficon IC/5.

Filament current is preset - Don't change.

After ~300 Angstroms of deposition, this rate may be increased to 3.0 Angstrom/sec. To change this while running a process:

**<F6> Program, <F2> Process Directory <F5> Process. Change rate, <E>. <F6> Process Dir <F6> Program <F6> Operate**

**If anything seems out of the ordinary, abort the run “Abort”<F12> and contact staff immediately.**

Following the run, remove samples, then remove foil inserts, and thoroughly vacuum chamber, including inside chamber door.

Follow normal end of run procedures as listed on page 10.

**After any “messy” runs:** Please run 500A of Al to seal the chamber walls.

## CHAMBER/SAMPLE TEMPERATURE CONTROL FEATURE

### 1. PLEASE NOTE:

- a. There is significant overshoot when the temperature controller first tries to reach set-point temperature, if your samples are sensitive to temperature, you may need to step the temperature up in stages.
- b. Heating your samples will also add considerable time to your process.
- c. **DO NOT** vent the chamber if the temperature is above 70 C, and use care when removing hot samples.

### 2. To set the Watlow 96 Temperature Controller

**DO NOT OPERATE CHA WITH HEATING WITHOUT SPECIAL NBTC STAFF TRAINING !**

- a. Press and hold the **V** or **Λ** buttons to increase or decrease the SetPoint Temperature (displayed in green on the lower display)
- b. **MAKE SURE TEMPERATURE SET-POINT IS < 300.0 C**

### 3. To set the Siemens Controller (to enable heating by the Watlow 96 Controller)

**DO NOT OPERATE CHA WITH HEATING WITHOUT SPECIAL NBTC STAFF TRAINING !**

The current chamber temperature is the upper number on the REX F700 Temperature Controller display (#1 in Fig. 1). Reading is from a thermocouple located near the center of the chamber.

- a. Click on the **SYSTEM IN STANDBY** button on the PC screen to deactivate standby mode
- b. Click on the **RECIPES** button
- c. Click on **SYSTEM PARAMETER SETTINGS** button
- d. Look for **HEATER PARAMETERS** in the lower left corner of the screen
- e. Click on the **CONTINUOUS** button to turn it ON, it should turn from **RED** to **GREEN**. (**CONTINUOUS ON** will heat the sample to the set-point temperature before deposition starts, then holds at the set-point temperature until the completion of the run)
- f. The **HEATER POWER** button should be set at **HIGH** (The **HEATER POWER HIGH/LOW** button will always remain **GREEN**)
- g. Set the **TEMPERATURE WATCHDOG TIMER** by clicking on the existing value, then use the mouse on the pop-up numeric keypad to set the new time in MINUTES. (The **TEMPERATURE WATCHDOG TIMER** is the time allowed to reach the set-point temperature. if the timer expires before the set-point temperature is reached, the run is aborted. Restart the run if this happens. This can be used to step the temperature rise to minimize the overshoot at the set-point temperature. A "NON-DEP TIME HOLD"

message will appear at the bottom of the IC5 Deposition Controller screen during this process)

- i. Double check the **NEW VALUE** box and hit **OK**
- h. Set the **SOAK TIME** by clicking on the existing value, then use the mouse on the pop-up numeric keypad to set the new time in MINUTES. (The **SOAK TIME** is the delay time between the chamber reaching the set-point temperature and the start of the Deposition, a “NON-DEP TIME HOLD” message will appear at the bottom of the IC5 Deposition Controller screen)
  - i. Double check the **NEW VALUE** box and hit **OK**
- i. Click the **DONE** button to get back the Recipes screen
- j. Click the **DONE** button to get back the Main screen

#### 4. After the run is complete

- a. **DO NOT** vent the chamber if the temperature is above 70 C, and use care when removing hot samples.
- b. Reset the Siemens Controller so that the **CONTINUOUS** button is OFF, it should turn from **GREEN** to **RED**
- c. Reset the Siemens Controller so that the **PREHEAT** button is OFF, it should turn from **GREEN** to **RED**