

Standard Operating Procedure for 4 Target E-Beam Evaporator

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Before Starting the process check the following

1. In case the system is OFF, Please check if the chiller is ON. If chiller is OFF then follow the steps to turn on the chiller.
2. Make sure the water supply lines EB3 IN and EB3 OUT are both **ON**.
3. Make sure that N2 cylinder kept outside Micro I is at 5kg/cm². If the cylinder is empty, then get it replaced with help from the facility staff.
4. Start the system by switching on the MCB available on the (right) side of the system.

Switching on the Chiller

1. Check the valves if they are OPEN.
2. Switch ON the main MCB from the distribution board RYB lamps will glow.
3. Switch ON the MCB on the chiller panel.
4. Switch ON the PUMP switch on the panel.
5. Switch ON the COMPRESSOR switch on the panel.

If the system was left in initial vacuum

1. Check to make sure that the combination valve (CV) is in “**Backing**” position. **Close** the gate valve.
2. Switch the turbo to standby ON. Vent the chamber with N2 by turning the N2 valve and air inlet valve.

3. When the chamber reaches atmospheric pressure, close the N₂ valve and air-inlet valves and hoist up the chamber by using the “hoist-up” knob present on the control panel.
4. Load the samples on the substrate holder firmly using the available pins.
5. Make sure required metals are loaded. Note down crucible position of different metals in the log book. Keep the replaced crucibles in proper labeled boxes and keep the dessicator in vacuum. In case the metal crucible has inadequate amount of metal target, you may load new slugs in the crucible and make an entry in the logbook. Do not load excess metal slugs.
6. Turn ON the Digital Thickness Monitor (DTM). Make sure it is above 65%. If it is below 65% replace the crystal with a new crystal. Note the reading of DTM in the log book.
7. Close the chamber by using the hoist-down knob. Make sure that the chamber is properly aligned to the base to avoid any leakage.
8. Turn the Combination Valve to roughing position. Note the time in the log book. Wait for the pressure to drop to 5×10^{-2} mbar.
9. Turn the Combination valve to backing position. OPEN the gate valve slowly. Turn the turbo to Standby OFF mode. Now the chamber is connected to the turbo pump. Wait for the vacuum to reach 4×10^{-6} mbar. Note the time when system reached the desired vacuum.
10. After the vacuum reaches the desired level
 - (a) turn on the computer monitor and open the SQM-160 software. Go to Edit>Films and select the required metal and modify the required thickness and thickness set point as desired. Then Download this data to the DTM using ‘Download All’ option.
 - (b) Turn on the E-beam supply and E-beam controller. Turn on the e-beam gun after the Power LED glows (usually this happens in 5-6 seconds). Turn ON the Waveform Generator. Turn ON the current indexer. Turn the turret indexer to the required target Crucible(1,2,3,4).
 - (c) In case the beam current reading is not Zero, make it zero by repeatedly pressing the RESET button.
 - (d) In the software , select the required metal. Refer to the log book to know the range of beam currents required to the given metal. Note: Don’t rely on this previous reading for your process. Your requirement might be different and hence the beam current will be different from that mentioned in the log book.

- (e) Wait for sometime so that the metal begins to evaporate. Now press 'Zero' and then 'Open Shutter' in the software interface. Note: In case you press 'stop' and again press 'start', the software goes to the default metal (Pt2). This will lead to erraneous thickness depositions. Make sure you select the required metal again in case you press 'Stop' button.
 - (f) Now that the shutter is open, the deposition begins. Control the rate of deposition using the beam current. When a stable rate of deposition is reached, note down the beam current and deposition rate in the log book. After the end of the deposition, the shutter 3 will close automatically. Turn the beam current down to Zero immediately and wait for atleast 5 minutes before you begin depositing next metal. Warning : *Sometimes the shutter may not close automatically . In such situation close the shutter manually using the button provided on the DTM.*
 - (g) For depositing other metals, change the turret indexer to the required metal and follow the procedure from step 10.(d) above. Mention the details in the log book regarding Metal, process vacuum, Current used etc.
11. When the deposition is complete, turn OFF the turret Indexer, Waveform generator, Gun in that order. Check to see if the ebeam supply is hot. This can be determined from the exhaust of the ebeam supply. If it is warm then wait for few minutes till it cools down and then turn OFF the ebeam supply.
 12. Wait for 5-10 minutes. Close the gate valve and switch the turbo to Standby ON. Take your samples out by following steps 2 and 3.
 13. Bring the system to vacuum level of 5×10^{-6} mbar by following the steps 8 and 9.

If the system was initially OFF

1. Start the system by switching on the MCB available on the (right) side of the system.
2. Ensure that the gate valve is closed. Load the samples in the chamber by venting the chamber. Close the chamber after loading the samples.
3. Combination valve should be in closed position. Start the rotary pump and open the isolation valve. Put the combination valve in roughing position. Wait for pressure to drop to 5×10^{-2} mbar.

4. Start the turbo pump now and let it run in Standby ON mode. Put the combination valve in backing position and open the gate valve slowly. Wait for sometime to achieve the process vacuum.
5. Follow steps 10-13 to deposit the metal as per your requirement.

Turning OFF the system

1. Consult the SO before turning the system OFF.
2. Bring the chamber to High Vacuum state and then close the gate valve.
3. Switch OFF the turbo and the rotary pump. Close the isolation valve from behind.
4. Turn OFF the MCB on the right side.
5. Close the water supply lines EB3 IN and EB3 OUT.