Table of Contents

1.0 Purpose/Scope ........................................................................................................... 3  
2.0 Reference Documents .................................................................................................. 3  
3.0 Equipment/Supplies/Material ....................................................................................... 3  
4.0 Safety .......................................................................................................................... 3  
5.0 Set Up and Genius Controller Procedures ................................................................. 3  
6.0 Materials List ............................................................................................................... 5  
7.0 Operation Procedures ................................................................................................. 6  
7.0 Revision History ......................................................................................................... 8
1. Purpose / Scope

1.1 This document covers the procedure that should be followed for normal operation of the Lesker PVD75 PRO line Electron Beam Evaporator.

1.2 Sample sizes—any size up to a 300mm wafer. There is an issue with uniformity across the wafer. It is suggested to keep all samples within a 75mm from the center of the sample holder.

1.3 Source materials allowed: Contact ASU NanoFab for approval for any material not listed here.

2. Reference Documents

2.1 Chemical Safety & Hazardous Waste Management Rules & Procedures Handbook
2.2 PVD Series Operation Manual
2.3 Kurt J Lesker Circular Sputtering Source Torus 3” HV operations manual

3. Equipment / Supplies / Material

3.1 Clean room vacuum.
3.2 Clean wipes.
3.3 Tweezers, Kapton tape.

4. Safety

4.1 Follow all safety procedures outlined in the NanoFab Handbook
4.2 Follow safety procedures for high voltage when working with high voltage or RF energy.
4.3 Follow safety and handling procedures when working with vacuum systems and source materials.
4.4 Do not attempt to repair the tool under any circumstances. Submit a service request and contact ASU NanoFab staff.
4.5 Red EMO Button can be pressed at any time an emergency situation arises. Contact NanoFab staff to follow up with any emergency condition.

5.0 Set Up & Genius Controller Procedures

5.1 Stack Light. The stack light has 4 lights to indicate status of the tool. The green light indicates that everything is OK. The blue light indicates that there is a recipe that is running. The yellow light indicates an alarm condition. The red light indicates an abort condition.

5.2 Insure Lesker 4 placard is UP (Green).
5.3 Sign in and start a run on the NanoFab run log with your intended materials and thickness.
5.4 Eclipse Software
   5.4.1 The software is running when the tool is idle. The roughing pump and turbo pump will be ON (shown green) and the chamber will be under vacuum.
5.5 Tool preparation
5.5.1 Select the Deposition page on the display.
5.5.2 Refer to the Sensor Status box; ensure that all 3 sensor boxes are green.

5.6 Genius Controller operations.
5.6.1 Open the door and ensure that the Genius Controller displays “Automatic operation”.
5.6.2 LH and RH denote left hand joystick and righthand joystick. Up, down, left and right denote the arrow direction.
5.6.3 Press the MENU/QUIT button at any time to return controller to the top page.

5.6.4 Set to Automatic Mode from the top page.
5.6.4.1 Press MENU/QUIT button
5.6.4.2 LH-down to Auto/Manual
5.6.4.3 RH-down to Automatic operation
5.6.4.4 Press MENU/QUIT button
5.6.4.5 Ensure display shows Automatic

5.6.5 Set to Manual Mode from the top page.
5.6.5.1 Press MENU/QUIT button
5.6.5.2 LH-down to Auto/Manual
5.6.5.3 RH-up to Manual operation
5.6.5.4 RH-right (ensure arrows are pointing to service) than RH again (login) and enter code of 2031

5.6.6 Load crucible liners with the chamber vented
5.6.6.1 Set controller to manual mode.
5.6.6.2 LH-up or down (Set pocket).
5.6.6.3 RH-up or down (Choose pocket).
5.6.6.4 RH-hold joystick to the right until crucible rotates and stops at the desired position.
5.6.6.5 Place desired crucible liner with source material in pocket.

5.6.7 Select a pocket with chamber under vacuum.
5.6.7.1 From the deposition page; enter the number of the pocket into the Crucible set point box.

5.6.8 Select a Process
5.6.8.1 Press the MENU/QUIT button on the Genius controller
5.6.8.2 LH down to Save/Load
5.6.8.3 LH right
5.6.8.4 LH down to Open Process
5.6.8.5 RH down to Select Process
5.6.8.6 RH right to Open
5.6.8.7 Press MENU/QUIT when finished
6.0 Materials List

6.1 Lesker 4 Material List
If the material is not listed, check with ASU NanoFab staff for approval.

<table>
<thead>
<tr>
<th>Allowed Materials</th>
<th>Not Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>Gold</td>
</tr>
<tr>
<td>Aluminum Oxide</td>
<td>Silver</td>
</tr>
<tr>
<td>Bismuth Ferrite</td>
<td>Copper</td>
</tr>
<tr>
<td>Chrome Silicon</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td></td>
</tr>
<tr>
<td>Cobalt</td>
<td></td>
</tr>
<tr>
<td>Germanium</td>
<td></td>
</tr>
<tr>
<td>Hafnium</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td></td>
</tr>
<tr>
<td>ITO</td>
<td></td>
</tr>
<tr>
<td>Magnesium Fluoride</td>
<td></td>
</tr>
<tr>
<td>Molybdenum</td>
<td></td>
</tr>
<tr>
<td>Molybdenum Oxide</td>
<td></td>
</tr>
<tr>
<td>Nichrome</td>
<td></td>
</tr>
<tr>
<td>Nickle</td>
<td></td>
</tr>
<tr>
<td>Niobium</td>
<td></td>
</tr>
<tr>
<td>Palladium</td>
<td></td>
</tr>
<tr>
<td>Platinum</td>
<td></td>
</tr>
<tr>
<td>Silicon</td>
<td></td>
</tr>
<tr>
<td>Silicon Dioxide</td>
<td></td>
</tr>
<tr>
<td>Silicon Monoxide</td>
<td></td>
</tr>
<tr>
<td>Tantalum</td>
<td></td>
</tr>
<tr>
<td>Tantalum Pentoxide</td>
<td></td>
</tr>
<tr>
<td>Tin</td>
<td></td>
</tr>
<tr>
<td>Titanium</td>
<td></td>
</tr>
<tr>
<td>Titanium Dioxide</td>
<td></td>
</tr>
<tr>
<td>Tungsten</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td></td>
</tr>
</tbody>
</table>
7.0 Operation Procedures

7.1 Vent Chamber

7.1.1 Sign in and start a run on the NanoFab run log with your intended materials and thickness.

7.1.2 Enter Crucible Setpt to your intended pocket you wish to use before you Vent.

7.1.3 Select Vacuum screen to view the current tool pressure.

7.1.4 Insure the Genius controller is set to Automatic operation mode, the desired material and pocket, and desired data set.

7.1.5 Depress PC Vent button. Wait till this recipe shows complete.

7.1.6 Open the chamber door.

7.1.7 Use the Nilfisk vacuum to remove any loose particles from inside the chamber if necessary.

7.1.8 Replace the chamber viewport Mylar liner in the view window if necessary

7.2 Load source material

7.2.1.1 Place source material in pocket if required. Ensure material in the crucible liner is enough but note clearance. Al is typically placed on pocket 4.

7.3 Load Substrates

7.3.1 On the Deposition screen, depress the Substrate Shutter button to Open (Blue).

7.3.2 Depress the Home Substrate Motor button to Home the platen.

7.3.3 Remove the platen. Be careful not to bump the crystal when removing.

7.3.4 Load substrate(s) into the center of platen with clips or Kapton tape.

7.3.5 Reinstall platen into chamber carefully.

7.4 Close the chamber door.

7.5 On Deposition page, insure XTAL quality is >60%. Notify engineering if XTAL requires replacement before the chamber is pumped down.

7.6 Pump Chamber Down

7.6.1 Depress the PC Pump button on right side of screen. The Pump PC recipe will complete with a pressure of 5.0E-5 Torr. Lower pressures are recommended.

7.6.2 When recipe meets 5.0e-5 Torr pressure, enter “time remaining” value on the NanoFab log sheet.
7.7 Run Deposition Recipe.

**7.7.1 Warning:** Do not leave tool unattended while the Beam Power is ON.

7.7.2 Select Run Recipe button on the Deposition screen.

7.7.3 Choose desired Deposition recipe.

7.7.3.1 Al, Cr, MgF2, Pt, Ti material recipes are currently available.

7.7.4 The Parameter Passing Recipe window will open up.

7.7.4.1 Enter the crucible pocket, target thickness, and dep rate (1 – 3Å/sec).

7.7.5 Select the Continue Load button. The recipe will now START processing.

7.7.6 After the eBeam Soak1 & Soak2 steps, the Shutter Delay step will start.

7.7.6.1 Time of 450 secs to increase power to get to 50% of the dep rate setpoint.

7.7.6.2 If material dep rate slowly rising, set Time mode to Pulse mode. Remove Pulse mode when dep rate at 50% of intended value.

7.7.7 Monitor eBeam and parameters during processing.

7.7.7.1 Insure eBeam is on targeted properly on material.

7.7.7.2 Monitor that Dep Rate and Power levels are stable.

7.7.8 Enter the Power value on NanoFab run log towards end of the dep.

7.7.9 When recipe completed, Blue light turns off and “completed” message displays.

7.8 Post Deposition

7.8.1 Before Venting the system; allow 5 minutes for the system to cool off.

7.8.2 Depress the PC Vent button.

7.8.3 Open chamber when the Vent recipe is completed.

7.8.4 Unload Substrates.

7.8.4.1 On the Deposition screen, depress the Substrate Shutter button to open (Blue).

7.8.4.2 Depress the Home Substrate Motor button to home the platen.

7.8.4.3 Remove the platen. Be careful not to bump the crystal.

7.8.4.4 Unload substrate(s). Reinstall platen.

7.8.5 Clean the inside of the chamber with the Nilfisk vacuum. Do not use the vacuum on the filament or source metals as it may contaminate them.

7.8.6 Replace the view port Mylar liner as a common courtesy to next user.

7.8.7 Close the chamber door.

7.8.8 Depress the PC pump button to pump down the chamber.

7.8.9 Change the tool status to Run Completed on the NanoFab run log.
## Revision History

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Originator</th>
<th>DESCRIPTION OF REVISION</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/27/14</td>
<td>Todd Eller</td>
<td>Initial Release</td>
<td>A</td>
</tr>
<tr>
<td>1/25/18</td>
<td>Todd Eller</td>
<td>Update procedures</td>
<td>B</td>
</tr>
<tr>
<td>8/21/18</td>
<td>Jaime Quintero</td>
<td>Checklist version of operating procedures.</td>
<td>C</td>
</tr>
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</table>