NCMN
Nebraska Center for Materials and Nanoscience
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Intlvac Nanoquest-I IBM Operating Procedure

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1 Introduction

1.1 Key Words

Ion Beam Milling (IBM), Magnetron Sputtering

1.2 Purpose

This document provides instructions for operating the Intlvac Nanoquest-I Ion beam milling (IBM) system, which provides state-of-the-art Argonne ion milling capability. Use of this tool requires the understanding of the fundamentals of ion milling knowledge.

1.3 Applicability

1.3.1 Locations

The tool is located at **Clean room of nanoscience research center**.

1.3.2 Safety

The safety concern is the system uses high voltage electricity and high pressure gases.

1.3.3 Restrictions and Limitations

- Must be a qualified user of IBM.
- The imitation for the substrate is that it must not damage the system.

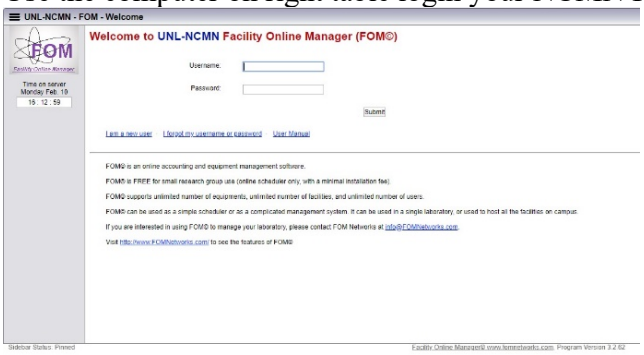
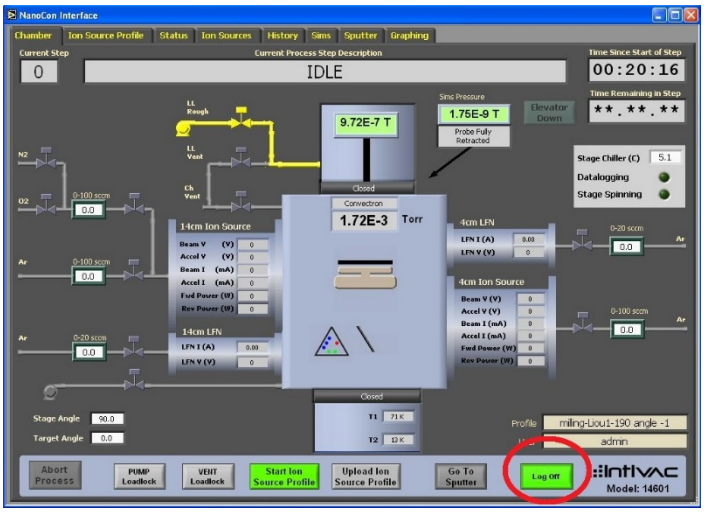
1.4 Restrictions on Working Alone

- Normal working hours are from 8am to 6pm M-F.
- Working alone is permitted with completion of an orientation to this written procedure and hands-on training from the specialist.
- Assistance from the specialist is available during working hours only. If an error occurs during off-hours, record the error in the Logfile and send an email to the specialist. **Do not try to fix or adjust anything by yourself.** Tool will be checked in the following work day. User will be notified when sample left in chamber is available for pickup.
- Problems with equipment malfunctions, breakage, etc. should be reported to the specialist and recorded in the tool Logfile. **Again do not try to fix or adjust anything by yourself.**
- In case of gas leakage or any other danger, press the "EMO" button on the front panel of the system and leave the room immediately. Contact the specialist right away.
- For any emergency involving injuries, fire, chemical spills, etc., call **911.**

2 Preparations

- Receive this procedure from the specialist.

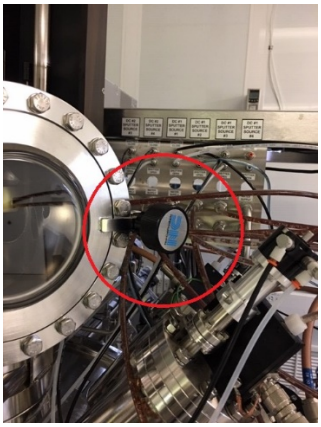
3 Execution (Step-by-step work breakdown)

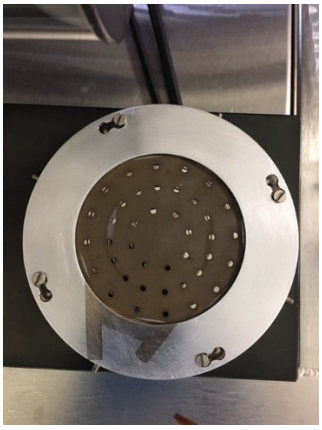
Step #	Action
1.	**Logon equipment through NCMN FOM**: • Use the computer on right table login your NCMN FOM account.  • Locate equipment "NANOFAB - RIE" and follow the screen to logon the equipment • Once the equipment is logon, the screen on the tool will turn on automatically.
2.	**Checking status of the system before starting**: • Make sure the Oxford user control software "NanoCon Interface" is running on the left screen of the dual-monitors. If not, inform Specialist. • The system is under proper vacuum condition: Load-lock chamber is ~10^{-6} Torr; process chamber is ~10^{-8} Torr. • Make sure Cryo-pump works properly (Check cold head temperatures). • Ensure no warning signals on the screen • Click "Logon" button at lower right corner, following the screen to start software. 

3. Loading the Sample in load-lock:

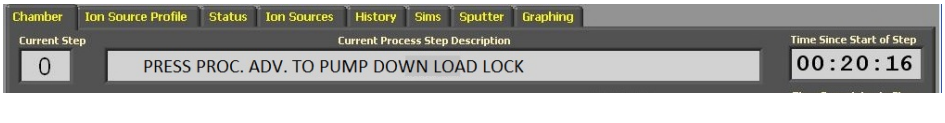
- Click “Vent Loadlock” button and loose the latch to vent the load-lock. Wait until the procedure finish (~3 min). **Vent won’t start without loose the latch**.

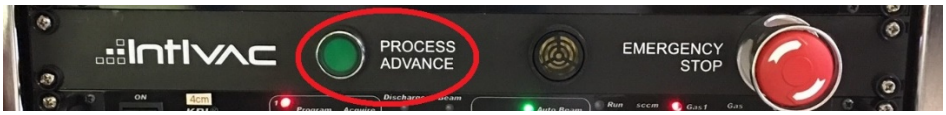
- Open the load-lock door. Put the Chuck on the sample holder and make sure all four pins hold steadily. Close the load-lock door and the latch.

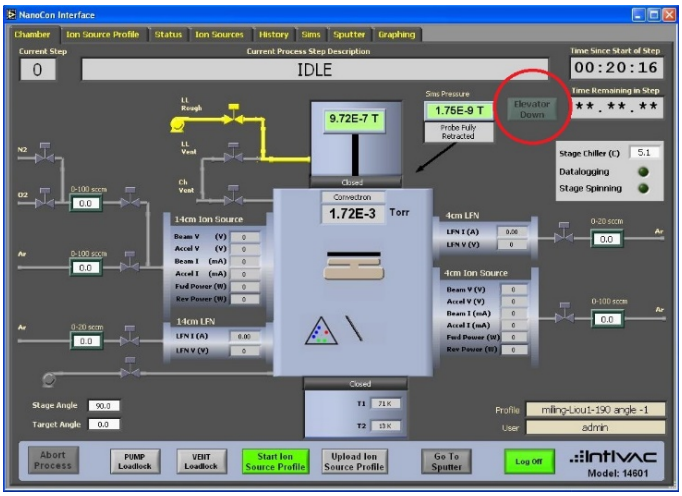
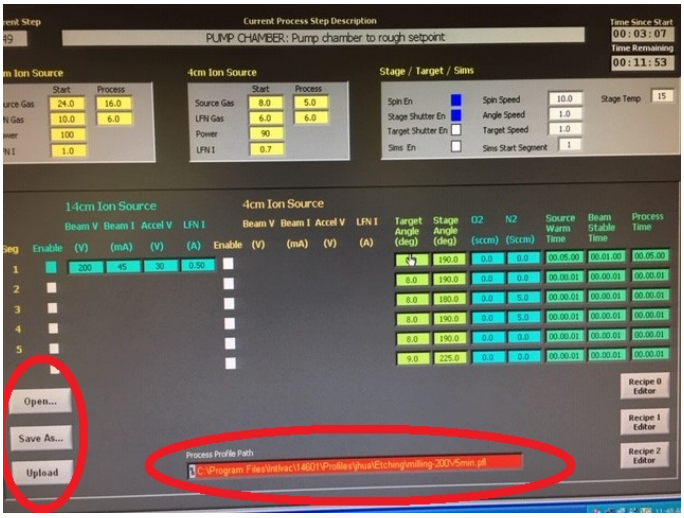


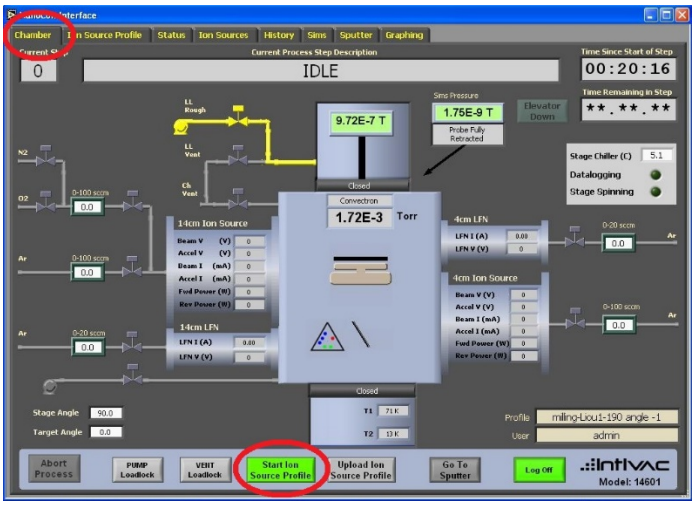
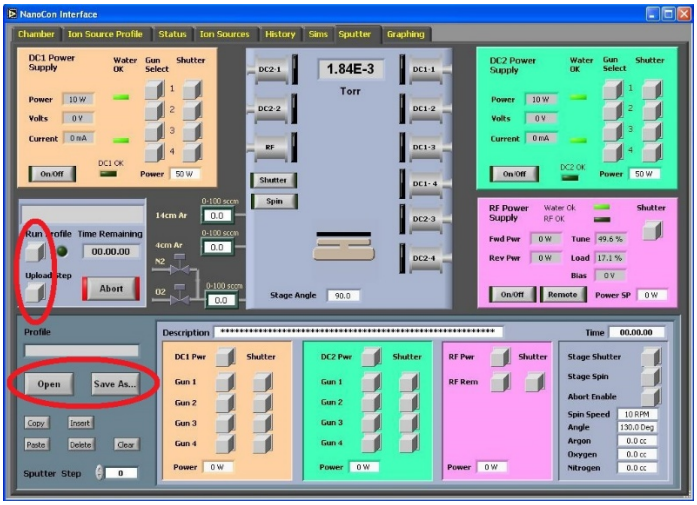


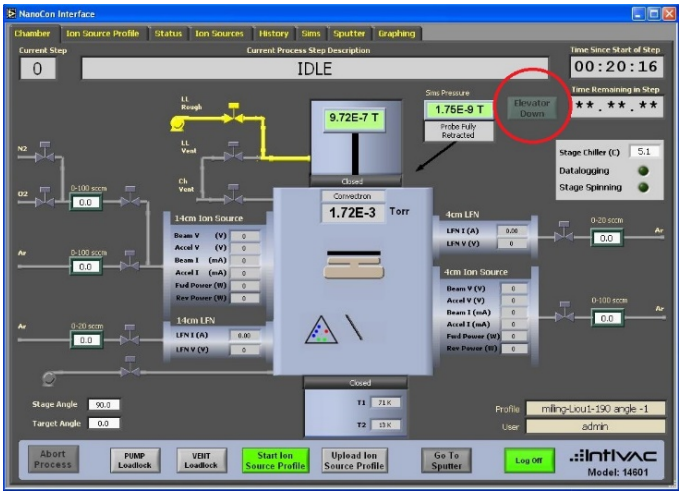
- Following the message in “Current Step Description window”, press Process Advance button on the rack to pump the load-lock. Wait until the procedure finish (~10 min). **Do not** interrupt this process.





4.	**Transferring the Sample in main chamber:** • Wait load lock reaches base vacuum, VAT valve between load lock and main chamber will open automatically. • Click “Elevator Down” button to lower the Chuck. Take transfer rod off the elevator and rotate (~4-5 turns, until stop) along “<— ON” direction to screw the chuck on stage. Turn the rod 10 degree backward, lift it up and put it on to the elevator. • Click “Elevator Up” button to raise the rod, wait until it reaches the top.  • Press Process Advance button on the rack to close VAT valve between load lock and main chamber. System is ready for process now.
5.	**Create, Edit/Run Ion Beam Milling Process:** • Click “Ion Source Profile” tab on top to create/edit ion milling/sputtering recipe.  • Click “Open” button and following the screen to load the pre-save recipe. Then click “Upload” button to upload profile to machine for execution. If the current profile does not match the one on the machine, the status bar will turn red and flashing.

	• Click “Chamber” tab on top to switch back to chamber page and click “Start Ion Source Profile” button to run the current recipe. Process can be stopped at any time by clicking “Abort Process” button. 
6.	**Create, Edit/Run Sputtering Process:** • Click “Sputter” tab on top to create/edit sputtering recipe. The top half is the status of the guns and chamber. The lower half is for recipe editing.  • Click “Open” button and following the screen to load the pre-save recipe. Then click “Upload Steps” button to upload profile; click “Run profile” to for execution. • Process can be stopped at any time by clicking “Abort” button.
7.	**SIMS/Ending Point Detector:** Please ask Specialist for more detailed information.

8.	**Transferring the Sample back to load-lock:** • Wait the process finishes, press Process Advance button on the rack to open VAT valve between load lock and main chamber. System is ready for transferring. • Click "Elevator Down" button to lower the Chuck. Take transfer rod off the elevator, align the position so that all four pins sit in the gaps, and then rotate (~4-5 turns) along "—> OFF direction to screw the chuck off stage. Turn the rod 10 degree backward, lift it up and put it on to the elevator. • Click "Elevator Up" button to raise the rod, wait until it reaches the top.  • Press Process Advance button on the rack to VAT valve between load lock and main chamber and finishes the transfer.
9.	**Unloading the Sample from load-lock:** • Press Process Advance button on the rack and loose the latch to vent the load-lock. Wait until the procedure finish (~3 min). **Vent won't start without loose the latch**. • Open the load-lock door. Take the sample out. Close the load-lock door and the latch. • Press Process Advance button on the rack to pump down the load lock. Wait until the procedure finish (~10 min). **Do not** interrupt this process. • Wait load lock reaches base vacuum, VAT valve between load lock and main chamber will open automatically. Press Process Advance button on the rack to close VAT valve between load lock and main chamber. **Do not leave the VAT valve open for long time.**
10.	**Log file Entries:** Fill out the log file in the right monitor with the corresponding parameters.

11.	**Log off the NCMN FOM software:** • **Log off but do NOT** exit NanoCon Interface. • Log off the system through the NCMN FOM.
13.	**Clean up all samples, pens, and notebooks from the area.**
End	**End of Procedure**

4 Post-Performance

4.1 Recordkeeping

Completely fill out the logfile.

4.2 Feedback

Report any unusual or problematic behavior of the setup by contacting the specialist.

5 User Access Level

Normal User – Requires specialist to be present

Expert User – Does not require specialist to be present