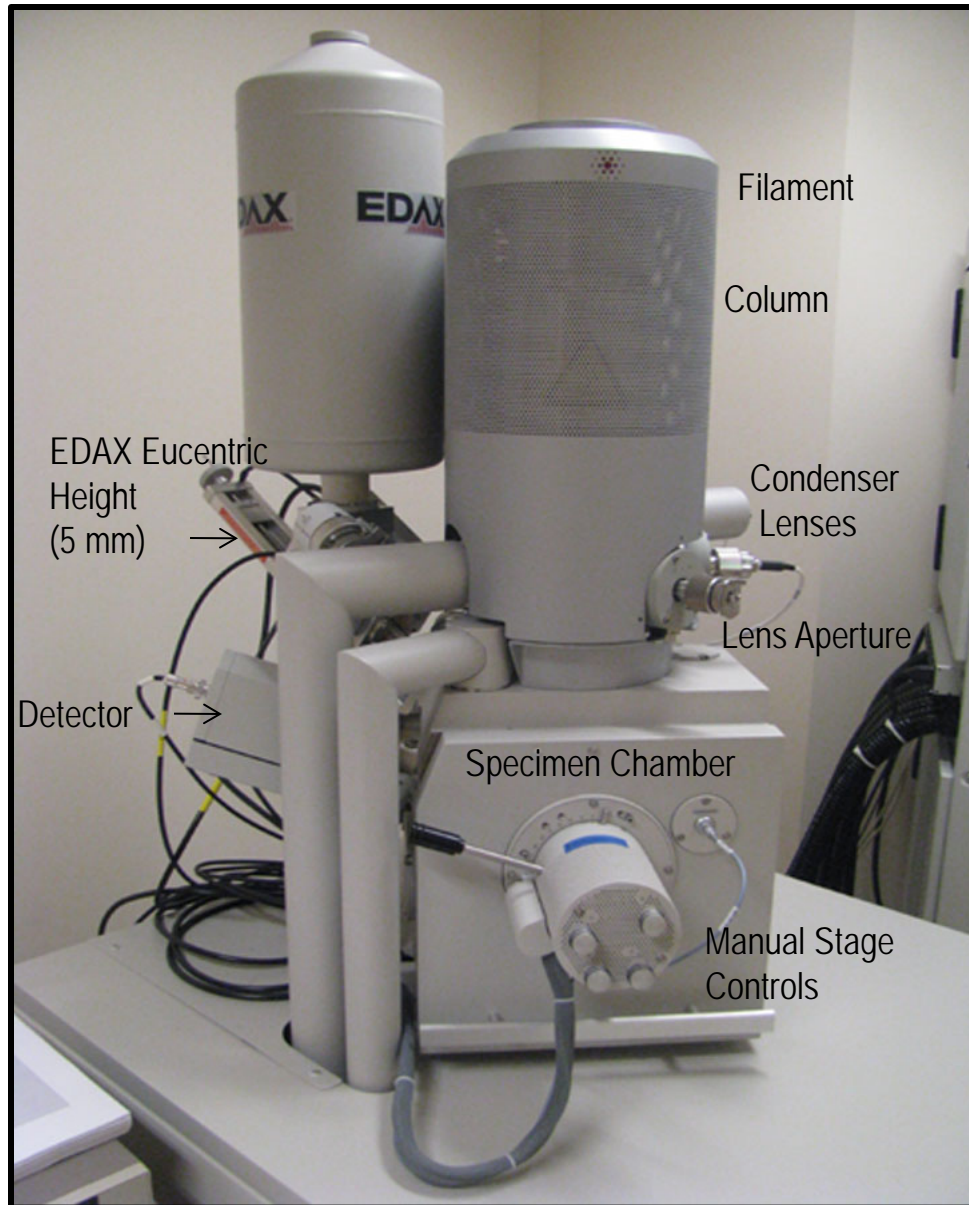




Scanning Electron Microscope

(FEI Nova NanoSEM 2300)

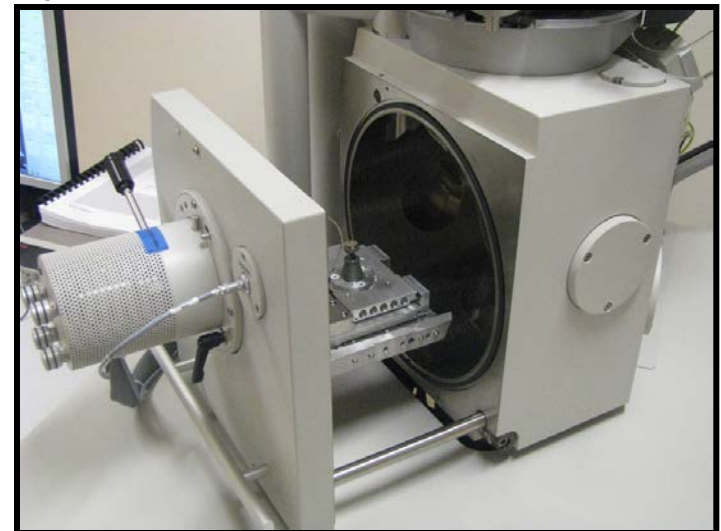
August 28, 2013



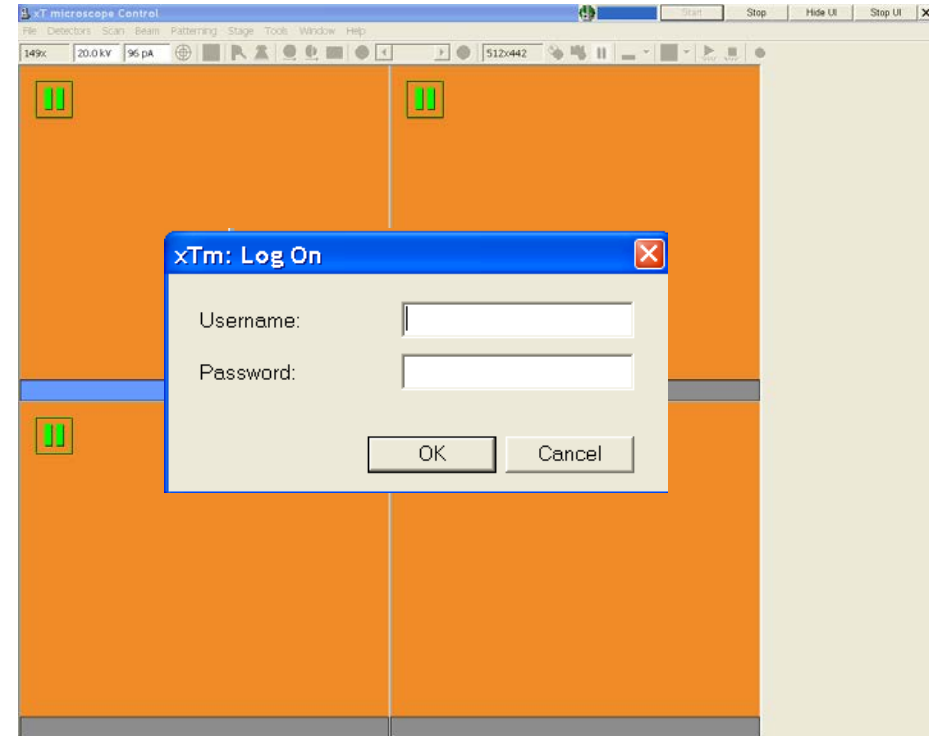
FEI Nova NanoSEM 2300

No magnetic samples for immersion mode; for inquiries contact NRF Staff for more information.

Specimen Chamber



Sign Into Microscope Server

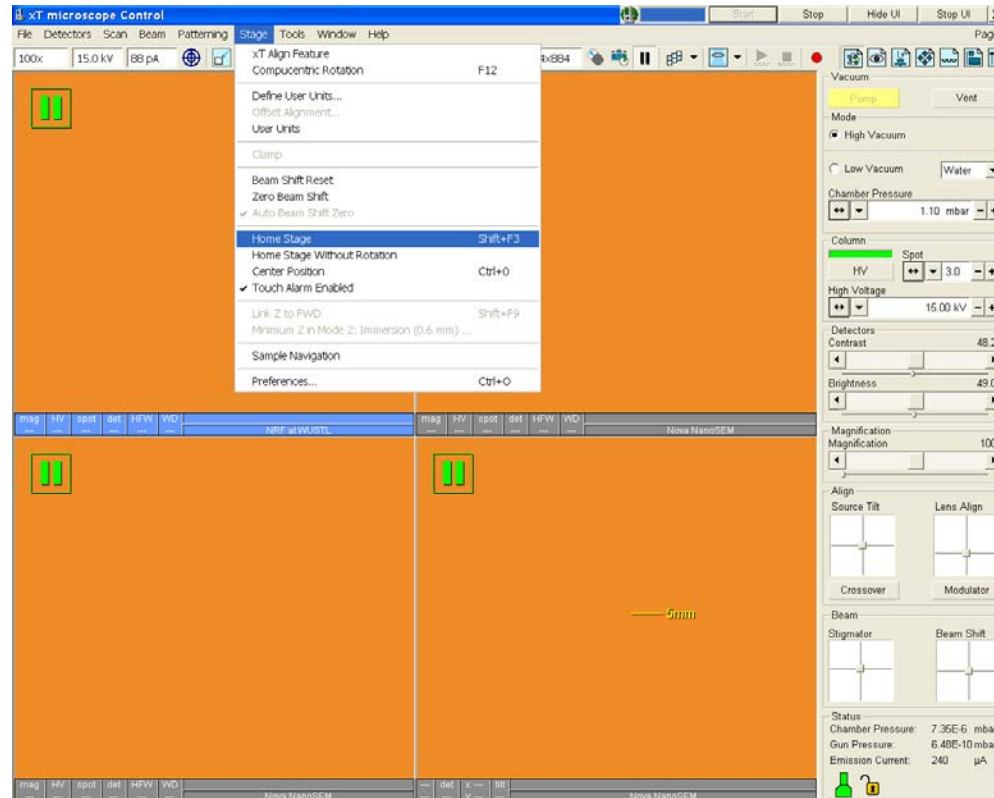


After signing in to the FOM system and signing the log book

1. Click Start
2. Log In

Home stage

Click Yes Home Stage. Home stage with rotation.



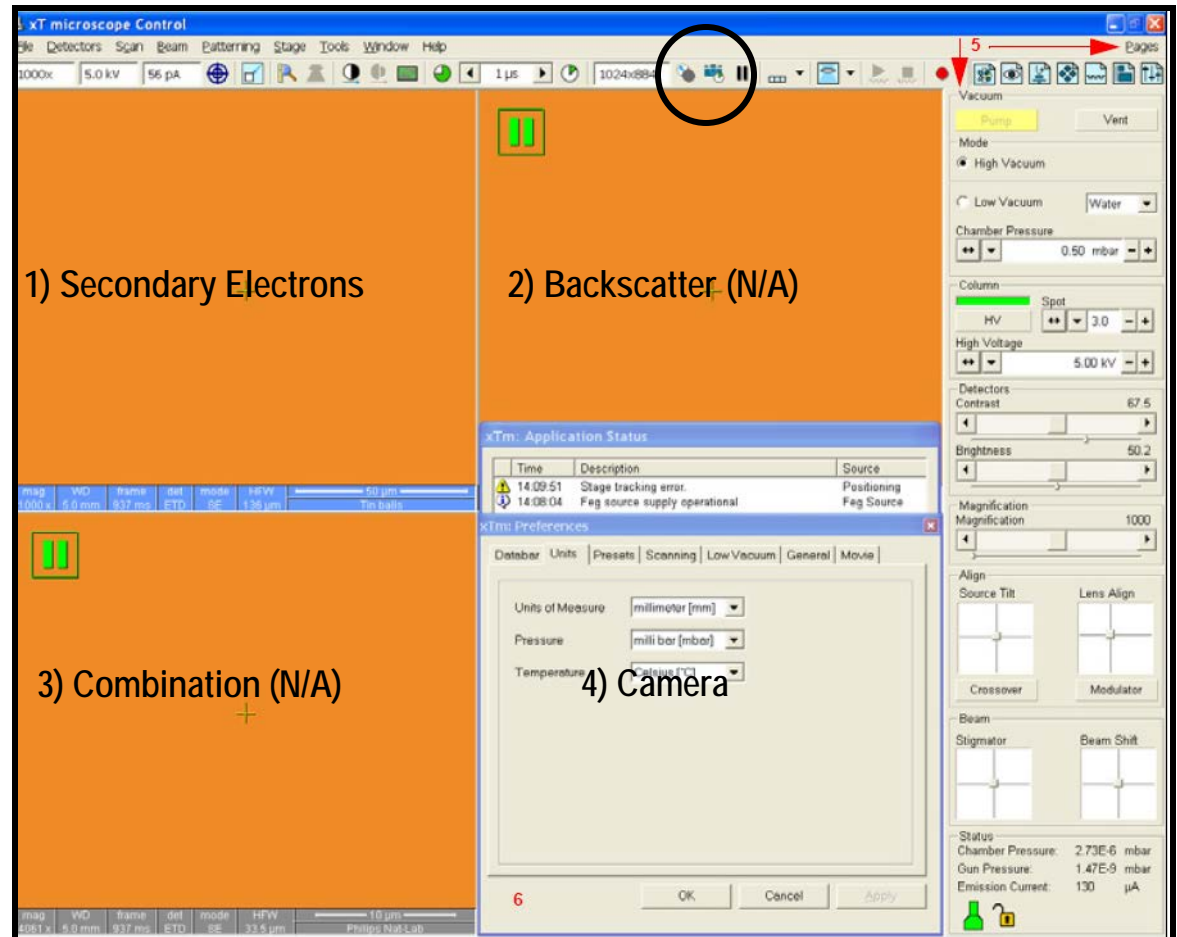
- Note:** Never connect internet to these two computers and use usb drive to transfer files.
- Note:** Turn off computer to reboot if any software freeze occurs during an experiment.
- Note:** Never touch any button on the front panel or the control panel, report problems.

Single versus Quad Images

Toggle between highlighted window and quad view with F5
(Only windows 1 and 4 are available.)

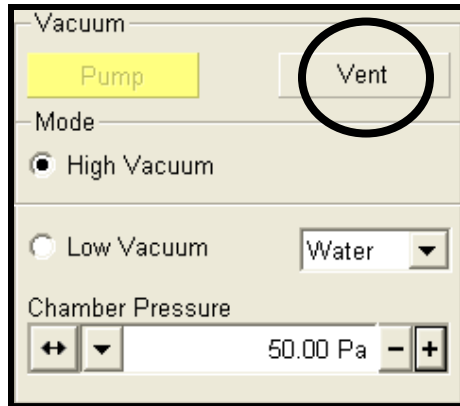
1. Activate a window by clicking on it; panel will turn blue.

2. Unpause windows by clicking on pause icon at top of screen.



Load sample

1. Blow samples with the nitrogen gun before loading samples.

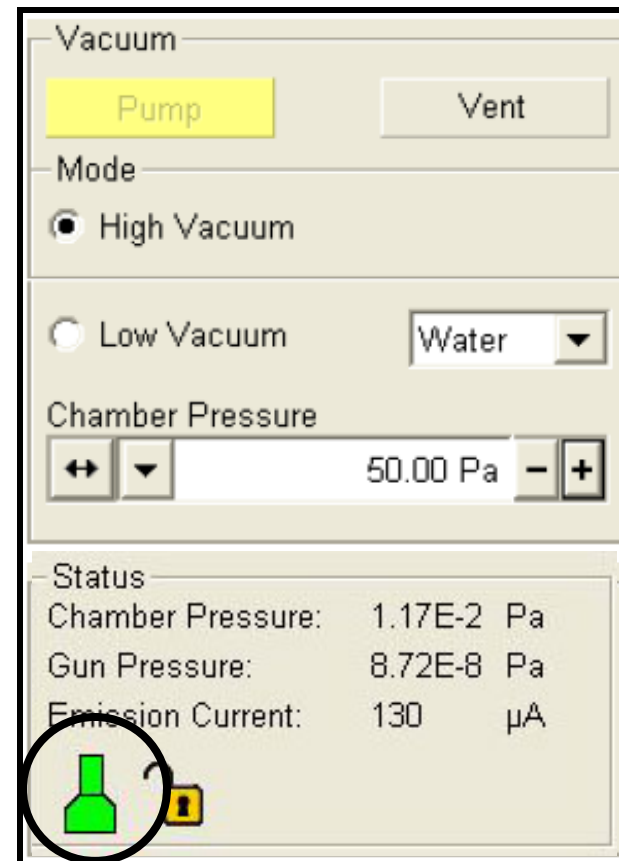
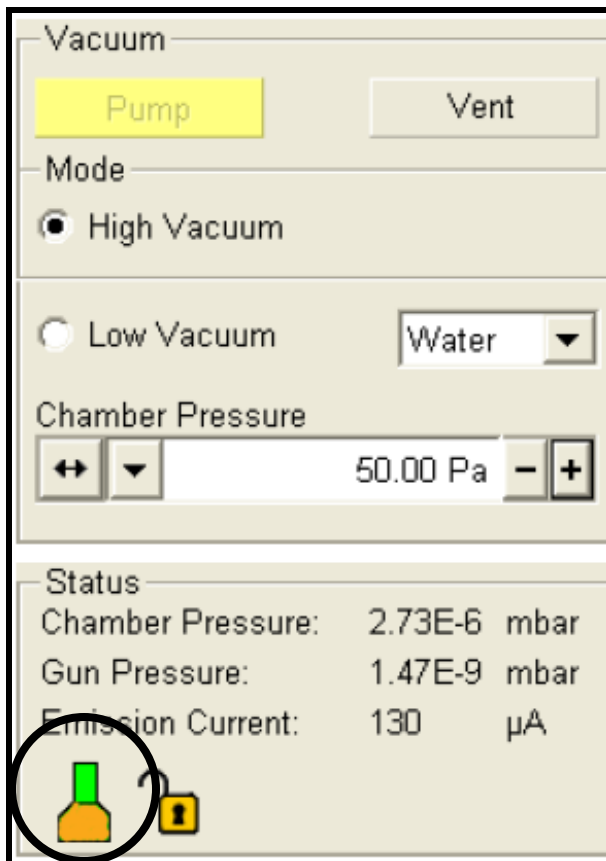


2. Put gloves on and select **Vent** in the **Vacuum** submenu. If chamber takes longer than 1 minute to vent, click **Pump** and notify Instrument Manager.
3. Insert sample stub and tighten using locking screw.
4. Close the chamber door and select **Pump**.

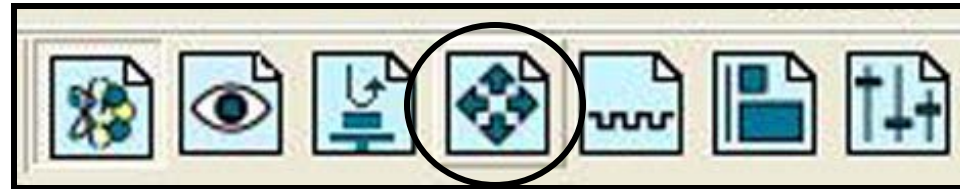
*Always wear gloves when loading samples into the chamber.
Load sample while nitrogen purge is active to avoid chamber contamination.
Do not over-tighten the locking screw, finger tight is adequate.*

Start-up Procedure – Pump chamber with sample

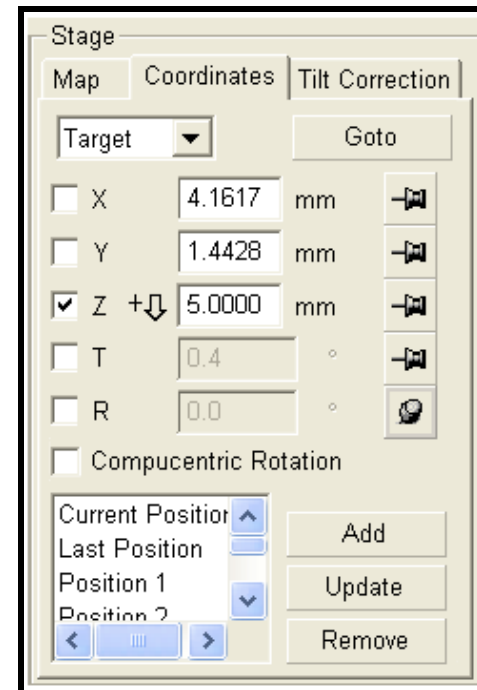
1. Wait for chamber to reach desired pressure. Bottom half of icon will turn green when chamber under vacuum.



Start-up Procedure – Establish Coordinates



Open Coordinates to view coordinates on stage (X:0, Y:0 is center).



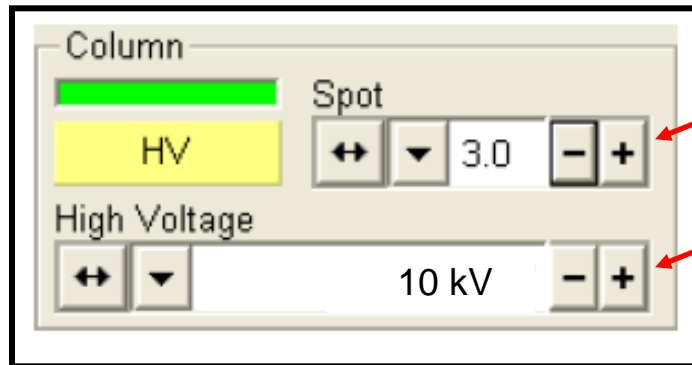
1. Click Navigation Tab

Start-up Procedure – continued

1. Select proper accelerating voltage and spot size for your sample.

Note: Lower kV (3-5) is better for non conducting samples

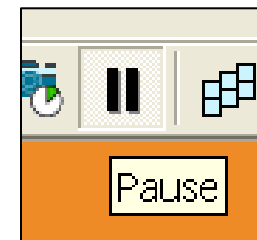
High kV (>10) is better for conducting samples



Adjust **spot size** here
(For EDX, Use 4.5)

Adjust **high voltage** here
5kV for Uncoated, Non-conductive
10-15kV Coated, Non-conductive

2. Turn on the accelerating voltage by clicking on **HV** button
3. Un-pause top left quad
4. Auto adjust brightness and contrast (F9).



Calibration of Working Distance and Stage Adjustment

This is a crucial step that should be conducted very carefully. If the calibration is not performed properly, the microscope can be seriously damaged.




WD: (Working distance) Distance between focal plane and nose piece

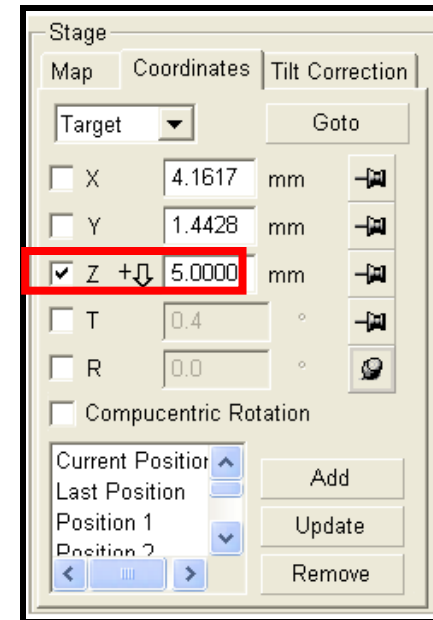
Z: Distance between sample and nose piece.

1. Focus on the sample with $> 2000\times$ magnification.

2. Click  to link Z and WD.

3. Move sample stage up close to 5 mm mark by clicking center button and dragging upward. Do not go past the 5 mm mark.

4. Focus on the sample with $> 2000\times$ magnification at 5 mm. Click  to link Z and WD.



Magnification is controlled by changing "+" or "-" on the keyboard.

The focus can be adjusted by moving the mouse to the left and to the right while pressing the right-button of the mouse

Make sure your image looks as focused as possible

Operating Parameters



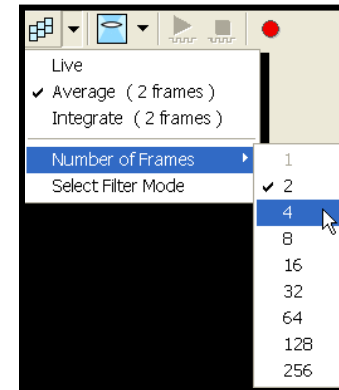
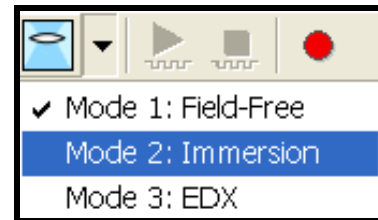
Field-Free (ETD): Use for imaging large areas or finding your sample.
(All samples.)

Immersion (TLD): No magnetic samples. Use for higher resolution imaging; only works at certain working distances. WD: 5 mm for 1-15 kV; 6.5 for 20 kV; 6.7 for 30 kV

EDX: universal samples, use for elemental analysis (refer to EDS manual).

Beam Optimization – Lens Alignment

Select Live mode (Scan/Live)

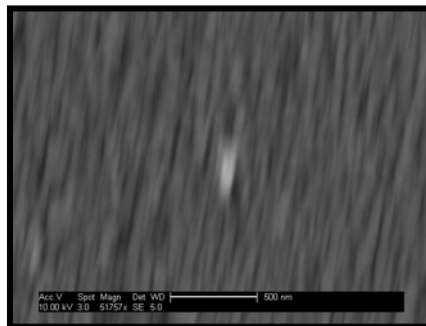
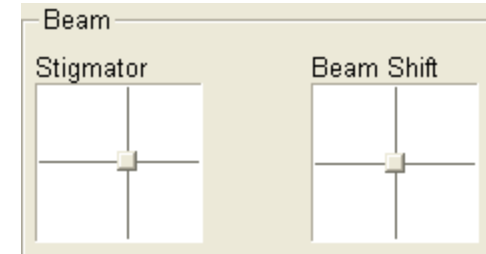


Select  and **Align** Tab.

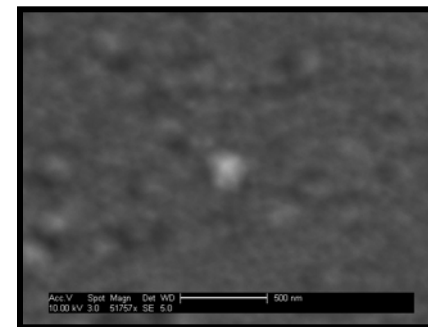
1. Click on "**Modulator**" in **Lens Align** and drag on the crossbars to correct image translation. The image should pulse in and out but not move side to side.
1. Right click on modulator and adjust sensitivity to "Fine" to make any final adjustments. Final image should oscillate in/out of focus. Turn off lens modulator.

Beam Optimization – Stigmation Adjustment

1. Obtain best possible focus on image.
Image should not be elongated in either direction (see examples below)
2. Right click on the beam shift window to zero out beam shift
3. Drag Stigmator cross bars to adjust X & Y until image resolution is well defined.
4. Re-focus image by dragging right mouse button left and right





Unfocused image with severe beam stigmation





Properly focused image with severe beam stigmation

Image Acquisition and File Saving

Preset scans: photo (F2, high res)  and snapshot (F4, medium res) 

Scan and capture: pause button  

Average: useful to non-conductive samples.  

Integrate: adds up frames to single averaged image.  


Save files as TIF/JPG/BMP.

Step	Action
1.	Select the area of interest and set the Magnification , the Scan condition and the Pixel resolution that are required in the captured image.
2.	Make the best image using any suitable method you are familiar with.
3.	Use the Snapshot / Photo (F2) / Pause (F6) function. The scan makes one screen / quad pass (or several passes when the number of integrated frames is larger) and pauses.
4.	The image can now be saved by Save (Ctrl + S) / Save As... function in the File menu.
5.	The scan can be released by clicking on the Pause (F6) button on the toolbar.

The conditions for good image quality are:

- Slow scan speed (longer dwell time) of the beam.
- Select a pixel resolution from the dropdown list box to suit the detail in the image, i.e. no tearing pixelated edges.
- Increase the magnification at least 2x above the desired value, focus and stigmatate (using the reduced area), then return the magnification back.
- Use the Videoscope to correct the Contrast and Brightness accurately, otherwise use the Auto C&B.

Shutdown Procedures

1. Click **HV** to turn off accelerating voltage.
2. Select **Vent** in Vacuum.
3. Wait for specimen chamber to come up to atmospheric pressure. With gloved hands, loosen set screw and take out sample stub.
4. Close the chamber door.
5. Select **Pump** in Vacuum. **Wait** for chamber vacuum status to turn green. 
6. Sign out of Microscope Server