Operating Procedures for SEM1
FEI XL30 FE-SEM

Start-Up

1) Sign in usage via the support computer.
2) If **Scandium** is not up on the middle monitor, double-click  button.
3) Click on the **CCD** button  in Microscope Control *(if not already yellow)*. This will give you a view of the sample chamber on the screen.
4) Check and if necessary adjust X (0), Y (0), Rotation (0), Tilt (0) and Z (15-20mm).
5) Select the **Vent** button in the Vacuum control box. Click **OK** in the dialog box and wait for the vacuum **Idle** message. It will take about 3mins for the chamber to vent.
6) Put on gloves and carefully open the chamber with handle. Place the specimen stub on the stage.
7) Check the height with the "elephant ear" gauge. The top of the sample should be just below the bottom of the "trunk". If it is not, lower the stage with the Z knob.
8) Carefully close the door – watch the monitor to be sure the sample does not hit anything.
9) Press the **Pump** button.
10) Go to the **Detectors** menu and select **SE**.
11) From the **Beam** menu, select an appropriate **kV** *(e.g. 1-30 kV)* and set the **spot size** to **3**
12) From the **Scan** menu, select **Slow Scan 1**.
13) From the **Magnification** menu, check that the **Reference** is set to **(Display).** If it has something other than Display inside the **( ),** click on it. A menu box will appear. Select Display and close the menu box.

Imaging samples

14) Once you see **Vacuum OK**, click the **kV button** *(in the Beam control box)*. **Do not remove the Confirm Focus message.**
15) Click the **Autocontrast** button  or modify the brightness and contrast using the sliders.
16) Magnification can be adjusted using the +/- keys on the numeric keypad, in the Magnification menu, or by clicking in the inner circle in  mode.
17) Focus by pressing the RIGHT mouse button and dragging to left or right. Selecting the **Selected area box** button  and **Slow Scan 2** may be helpful.
18) Once the sample is in focus, click **OK** on the **Confirm Focus** window. If at any time the **WD** on the databar does not match the **Z** in the Stage control box, click on the Z<=>FWD button to link them.
19) Move the sample using one of the following methods:  (click and hold in the direction you want to move the stage),  (double click will bring that point to center), or **arrows** on the keyboard. **Rotate** using the **R** knob on chamber door, or adjust **R** field in **Stage** control group.
20) Adjust the working distance of the sample by typing a value in the Z box or by turning the Z knob on the front of the SEM. **When changing the working distance, use the CCD**  **view to ensure the sample does not hit the pole piece.** The pole piece is very expensive and not covered under the service contract. The optimal working distance for the SE detector is between 10-12mm. The optimal working distance for the UHR detector is around 7mm.
21) Correct the astigmatism if necessary and only if you are above 10,000x. Access the stigmator function by pressing the SHIFT and right mouse button together. Move the cross hair left to right and top to bottom to until the image improves. Try to make the edges in the image as sharp as possible.
22) Adjust Spot Size if necessary (e.g., try 2 @ >50000x). A smaller spot size will give better resolution, but a grainier image.
23) To acquire a digital image, press **F2** for standard definition images (338KB) or press **F5** for high definition images (5MB).
24) For an F2 capture, wait for the  button to turn yellow. Then click  on the Scandium toolbar to transfer the image. The image will not freeze when collection is complete for an F5 capture. Click  to bring the high definition images in to Scandium.

25) Click  to have the data bar at bottom of the image. To **burn** the **scale bar** on to the image, click  . To preview the scale bar on the image, click  .

26) To **save** the images, click  . Select **Users** on the **F drive**. Type file name, press **Enter**.

27) If you have used an **F2** capture, click  off to revert to a live scan. An F5 capture will automatically go back to a live scan.

28) To use the Ultra High Resolution detector press the **UHR** button. The working distance must be set around 7.0mm and magnification must be higher than 1500x. The UHR button letters will turn black when the SEM conditions are met for UHR mode to function. The samples will need to be re-focused and the stigmation readjusted. **Do not use the UHR detector with any magnetic samples.**

29) To tilt the sample, move the sample to a working distance of >15mm and keep it there for imaging. Change detector and watch the tilting procedure on the CCD camera to be sure the sample does not hit the pole piece. The pole piece is very expensive and not covered under the service. Adjust tilt angle by typing a value in the **T** box (the range is 0º to 50º).

30) Images can be printed out on the small Sony photo printer using the IN/OUT menu and selecting “Video print”.

Leaving the SEM for the Next User

31) Decrease the magnification to the minimum value.

32) In the **Beam** control group, click on **kV** button to turn the filament **off**.

33) Click the CCD button  to view the inside of the chamber.

34) Set stage **Tilt** to 0, **Z** to >15mm, **X, Y, R** to 0.

35) In the **Vacuum** control group, click the **Vent** button. Wait for **Idle** message.

36) Carefully open chamber, with handle, and remove samples (wear gloves).

37) Close door and hold shut. In the **Vacuum** control group, select **Pump**. Verify the chamber starts to pump down.

38) Remove images from the support computer via e-mail or storage media.

39) Close **Scandium**.

40) Sign out of the usage log via the computer