

# University of Minnesota NanoFabrication Center

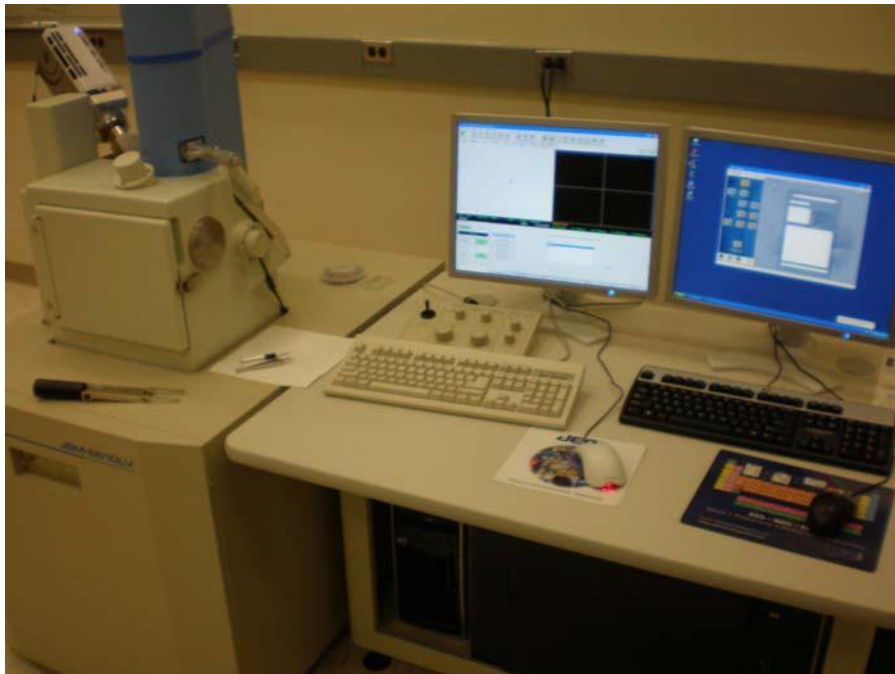
## Standard Operating Procedure

**Equipment Name:** JEOL SEM  
**Badger Name:** KA3 SEM JSM-6610LV  
**Model:** JSM-6610LV  
**Location:** Area 3

**Revision Number:** 5  
**Revisionist:** K. Roberts  
**Date:** 3/27/2020

### 1 Description

The JSM-6610LV is a scanning electron microscope (SEM) comprised of a tungsten electron column and an Oxford Instruments Inca X-Act EDS. It can image and analyze a wide range of conducting and non-conducting samples, as well as provide compositional information using the EDS.



### 2 Safety

a Must be a qualified user who has taken the short course and the follow-up with an NFC instructor before operating the machine independently.

### 3 Restrictions/Requirements

b Must be a qualified user who has taken the short course and the follow-up with an NFC instructor before operating the machine independently.

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### 4 Required Facilities

- a 240 VAC, 30 amps
- b 10 psi nitrogen

### 5 Definitions

- a Working Distance (WD) — physical distance between the sample surface and the pole piece of the e-beam column.
- b Focused Working Distance (FWD or 'WD' on Data Bar) — working distance as determined by the electron optics of the column. This value is displayed on the data bar of the image. This value changes as one adjusts the focus knob.

### 6 Setup

- a) Enable system in Badger.
- b) On left computer screen, log into User Acct, password nfc-123.
- c) Click on SEM Main Menu icon on left computer screen.
- d) On right computer screen, log into Inca Operator, password \_\_\_\_\_ (blank).
- e) Click on Inca icon on right computer screen.
- f) Vent the chamber
  1. Click **Sample Setting** in the Operation menu tab.
  2. Click the **Removing the specimen** button.
  3. Click the **VENT** button.
  4. The pressure in the specimen chamber becomes atmospheric pressure in 50 seconds. After the light of the **VENT** button turns ON, the stage can be opened to remove the specimen holder.
- g) Setting the specimen.
  1. Click the **Setting** button.
  2. Select the specimen holder used, and click the **Selection** button (usually  $\Phi 51$ ).
  3. In case the specimen is protruding, make sure to input the **Protruding height** in the dialog box.
  4. Set the specimen holder onto the specimen stage. Flat side toward back of chamber.

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5. Close chamber door and latch.

i) Choose a recipe .

1. Click the **Recipe** tab.
2. From the displayed list of **Standard** recipe, select a recipe applicable to the sample.

If you are not sure which recipe is applicable to the sample to be observed, select **Universal**. The standard observation conditions will be set.

3. The operation navigation is changed to the setup observation condition menu.
4. Set observation conditions according to the questions you will be asked.

If the specimen is not electrically conductive, not coated and High Vacuum is being selected, Acc. voltage is automatically set at 1kV. Under this condition EDS analysis question becomes grayed out, because the amount of signals for EDS analysis is insufficient.

5. Click the **OK** button. The observation condition will be set.

j. Evacuate the specimen chamber.

1. Go back to the **Sample Setting** tab.
2. Click the **Evacuating the Chamber** button.
3. Close the specimen chamber, and click the **EVAC** button. Evacuation in the specimen chamber will start.

k. Click the **Navigation** button.

1. Click the **Snap** (or **SNS Capture**) button to capture the image.

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- m. After the 'HT Wait' icon turns disappears, and the HT Off icon appears



you can start image observation, but it is better to wait 2 min. as

this will improve the vacuum and extend the life of the filament.

### 7 Operating Instructions

- a. Click the HT icon  to get HT ON .
- b. Click on the **Stage** tab.
- c. Double left click on your sample in the captured photo (may have to use SNS Switch). Set  $T = 0$  if  $T$  is still at  $-10^\circ$ .
- d. Minimize the user interface application window (upper right corner of screen).
- e. Double left click on IR Camera icon.
- f. Maximize user interface application window.
- g. Drag user interface application window up slightly so desktop tray can be viewed.
- h. Single left click on Z.
- i. Set  $Z =$  desired working distance (10 mm recommended first. Can reduce  $Z$  later when it is determined to be safe.)
- k. Double left click on WD. Set to 10 mm for proper focus.



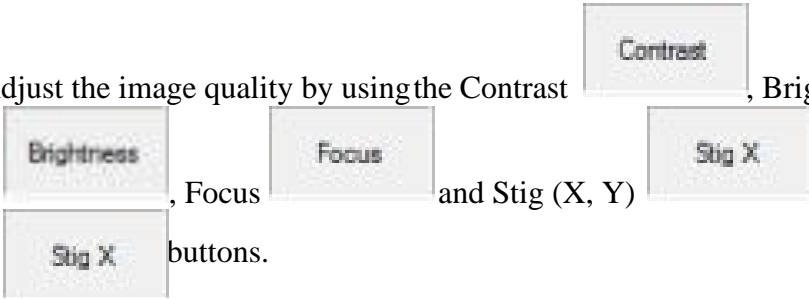
- l. Click the  the  icons to observe the image.

- m. Double-click the left mouse button at any position in main screen. The double-clicked position moves to the center of the screen.

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- n. Find view of interest.
- o. Get view of interest by increasing magnification gradually.
- p. Move view of interest to the center of the main screen, and set it at necessary magnification.

- q. Adjust the image quality by using the Contrast, Brightness, Focus and Stig (X, Y) buttons.
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- The diagram shows five rectangular buttons arranged in a grid. The top row contains 'Contrast' and 'Brightness'. The middle row contains 'Focus' and 'Stig X'. The bottom row contains 'Stig X'.

### 8 Shut Down Instructions

- a. Set Tilt = 0, Rotation = 0, X= Any, Y = Any
- b. Double left click on Z.
- c. Set Z to 80 mm.

- d. Click the HT icon  to get HT OFF .

- e. Click on the **Vent** icon.
- f. Open door when vented.
- g. Remove holder with fork.
- h. Remove sample(s) from holder.
- i. Leave holder on table.
- j. Close chamber door and latch.

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20k. Click on **EVAC**.

- l. You can leave SEM user interface open.
- m. If Inca EDS computer was used (right-side computer), close Inca user interface application (upper right corner of window).