

# FEI Nova 200 NanoSEM Operation Notes

## Standby Condition

- High Voltage OFF.
- Vent the chamber to recover the specimen then pump down to high-vacuum mode (chamber pressure  $< 1 \times 10^{-4}$  torr)
- Logout xT software and record sign the usage check list. Note problems if any.

## Sample Changing

- Verify your sample is clean. If possible, bake samples at 80°C before loading.
- High Voltage OFF, lower the stage to lowest position then vent the chamber. It takes ~1 minute to vent. It only requires 0.2mbar to vent the chamber. **Do NOT change the gas regulator.**
- Load the sample on stage. **Verify that sample is at or below the 5mm position** using the height gauge when the stage is at midrange. Adjust screw if necessary.
- Close door slowly while looking at live CCD image to **make sure that the specimen will NOT hit the pole piece (700,000-NTD worth)**. Hold the door closed and select Pump.

## Startup

- Log into WinXP and start xT services if necessary. The username and password is the same for both WinXP and xT user interface (UI). In case of the xT service failed to start, reboot the computer.
- Log into xT user interface.
- Load sample and pump down. This should take less than 4 minutes.
- **Sample should be below 5mm working distance.** Use z-height to bring sample up to near (but still below) 5mm marker.
- Wait for vacuum  $< 1 \times 10^{-4}$  torr before applying high voltage. After the HV has ramped up, select desire detector and unpaue scanning to begin imaging. **Record the vacuum mode, beam parameters, and vacuum pressure on the check list.**
- Select ACB then adjust image brightness and contrast as desired.
- Focus image and set link Z to working distance, set eucentric height (5mm FWD). **Record the sample composition and working distance on the check list.**
- Choose your scanning conditions by selecting dwell time, image resolution, and image averaging.
- Fine focus and tune stigmator to get clearest image at desire magnifications.

## SEM Modes

- Mode 1: Field-Free (HR): standard SEM imaging mode. Use *ETD* to image.
- Mode 2: Immersion (UHR): immersion lens mode for high resolution ( $> 2k\times$  mag,  $< 18kV$  at 5mm FWD). The immersion field effectively collects the SE for the *TLD* detectors.
- Mode 3: EDX: semi-immersion lens mode for improved EDX analyses.

# EDAX Genesis Operation Notes

## General

- Make sure that the Dewar is filled with liquid nitrogen
- Check the detector position. It should be 5cm from the center line. If the detector is to be moved, make sure that the detector head is not hit.
- **This detector is NOT compatible with BSED and LVD.** If low-vacuum or backscattered electrons are to be used, retract the detector before mount the detector on the pole piece.
- The detector line-of-sight converges with the e-beam at 5mm working distance. **To get the best result, adjust the working distance to 5mm.**

## Spectrum Acquisition

- **Turn off the IR camera and switch the SEM to mode 2 or mode 3.**
- Select an Amp time and/or spot size (beam current) based on the count rate (CPS, 1000-3000 if possible) so that the dead time (DT%) is between 20 and 40%. **Record the CPS and DT% on the check list.** In general, high CPS requires a shorter Amp time and the energy resolution will be decreased. Increasing the beam current or voltage will increase the CPS.
- Input the tilt angle so that the quantification can be done correctly. **Keep the pre-tilt of the sample in mind and put the number correctly.** Note that 0 tilt is defined as a flat sample, perpendicular to the beam direction.
- If desired, set a preset collection time (live time or clock time) so that the collection will be stopped automatically.
- Start and stop spectrum collection using the “**Collect**” button. During collection, the button will be yellow-colored.
- Adjust the view of spectrum by dragging the spectrum. To contract the energy scale, either control-drag the spectrum or use “contract” (><) key on the tool bar.
- Click the “**Peak ID**” for automatic peak identification. If the identification is not satisfied, expand the panel and do manual identification.
- “**HPD**” can be used for peak identification confirmation. When it is clicked, a theoretical spectrum is drawn on the collected spectrum based on the identified peaks and the collection parameter.
- Type in the spectrum label at the field on top of the spectrum (216 characters max). This will be saved and printed with the spectrum.
- For standardless quantification, click “**Quantify**” button. The result will use an automatic background subtraction (same as pressing “**Bkg**”). The spectrum and quantification results can be printed on one page by clicking on the buttons on the results dialogue.
- Spectrum can be saved as .spc (Genesis native file) or .cvs (Excel compatible). **Please save files on the Z drive** (same as the Z drive on the SEM computer).