

HITACHI S-3400N SEM: CONCISE OPERATION GUIDE

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WHEN YOU REACH THE SEM

- The SEM and computer will be ON
- The SEM Vacuum will be on (EVAC green light)
- Log in with your username and password
- Open the PC-SEM program (no password required for registered logged-in users)
- A dialogue box pops up asking for sample information, which has to be set before continuing with SEM operation

CHECKPOINTS:

- Make sure the sample stage is at **Z65** home position (upper-right corner, the blue marker before the Home Z65)
- Make sure the High voltage is **off** (upper-left corner, the blue marker before the OFF button, i.e. current = 0)
- Make sure the accelerating voltage (Vacc) is set at 5kV (this will be at the value set by the previous user, and not at a default low Vacc)
- Air the chamber (upper-right corner, **AIR** button)
- Wait for the air in and open the door (a couple of minutes, should hear a bleep sound)

LOADING YOUR SAMPLE

- Measure the size (height and width) of your sample with the white measuring tool and set it on the pop-up screen. The size is the largest diameter of the sample cross section. Height is the value you just measured using the white tool. When using the coolstage, the height should be measured after inserting the specimen in the stage.
- The system will ask you to confirm these dimensions to make sure no physical damage is done to detectors and lenses inside the chamber.
- Place your sample, and close the door
- Switch on the IR chamber camera to see the sample inside the chamber (ON/OFF button, and POWER button on small screen – only for SEM mode with SE detector -. switch off the camera when going to BSE detector, or when switching on the filament in VP mode.)
- Move mouse to side of screen to allow control panel to pop up with Condition, Image, Utility and Stage Tabs
- Select VP-mode or SEM **NOW** to prevent wet samples to go under high vacuum.
- Evacuate the chamber (upper-right corner, **EVAC** button) Vacuum will be <1Pa in SEM mode, and up to 270Pa in VP-SEM mode

SEM OPERATION

- Wait until the vacuum is ready (the ON button at upper-left corner is activated and turns black; it could take up to several minutes). In VP mode the selected pressure is indicated in Pa
- In Stage screen, click on MultiHolder when using the 4 stub holder, and select stub to be viewed. Click GO to automatically move to that position.
- Click on Stage in control box, and move your specimen to the required height (start with 20mm, click on GO). Wait and check the image on the IR chamber scope (see below).
- Repeat height setting to reach optimal working distance for imaging.
- Select Mouse Button Controls (select Options tab at top of screen) for stage movement, contrast & brightness, astigmatism
- Select proper Voltage conditions under Condition Tab (5-15-30kV are 'sweet spots' with highest emission rates for best resolution)
- Select proper Probe Current (start with value 50, which will allow a wide electron beam to reach the sample. This is equivalent to 'spot size' in other microscopes, and determines the resolution and depth of field - more important at high magnification)
- Select a proper Aperture (2 or 3 for low to medium magnification), externally on the column by turning in the correct aperture. Alignment is done when viewing the sample

- Turn ON Beam (click ON, upper left corner). If using BSE, switch off IR camera
- Use TV mode for viewing with SE, and slow scan (3 or 5) for BSE mode or for imaging
- ABCC to adjust image brightness/contrast
- AFC to adjust focus (focus manually on samples with low contrast)
- Adjust working distance once specimen is in focus. Minimum in this system is 5mm. For the multi-sample holder (4 stubs) the working distance will be limited by the height of the highest sample
- Click on 'Detail' in the Condition window to adjust the Emission Current. This is done by slowly adjusting the Gun Bias
- Align aperture mechanically at low magnification for brightest image (turn 2 knobs on column to align bright spot), while using high probe current (50 e.g.)
- Zoom in on area and focus at higher magnification (10 000x), using an appropriate spot size and working distance
- Align aperture electronically
- Correct for astigmatism
- Repeat alignment and astigmatism correction at higher magnification (3-4x working magnification)
- This set of conditions will be saved by the system for your session, even if you move to another set of parameters at a different aperture (which will then also be saved after you optimized conditions)
- Always focus at a higher magnification than your intended image will be taken. Your zoomed down image will be fine-focused for digital enlargement.
- Insert your image details under 'Settings' (3rd button from left, or under Image Detail in drop down menu on right)
- Your image is a play-off between beam current (kV), probe current and aperture (1-4) – and further influenced by astigmatism, beam alignment, emission current and contrast/brightness.
- Image: focus at high magnification, check alignment and astigmatism, select size and exposure frame time on upper Quick button (M). Capture 20 to 80 sec.

Quick buttons



- Freeze: freeze the image after a scan. Click Run to unfreeze again after capturing an image.
- TV1/2: to observe instant image = not to be used with BSE detector (in VP or High Vac SEM mode)
- Fast1/2: for fast scan, unstable samples, and with BSE detector
- Slow3/5: slow scan, better resolution, preparation for image capture
- Red1/2: reduced imaging area, for focusing purpose. Use Red3 for BSE detector
- ABCC: auto contrast and brightness; use it whenever you make changes (Mag, kV, etc.), or when starting viewing a new sample
- 640/1280: capture the image using preset conditions (40 or 80 second capture)
- PCI: transfer the captured image to PCI image management program
- SAVE: save the frozen or captured image directly into pre-selected folder.

Image Saving (quick buttons)

- Freeze and Save
- 640/1280 and PCI: pre-settings can be changed by right clicking
 - By frame: integration scan; used for unstable samples (sensitive to beam)
 - By time: line scan; used for stable samples
- For stereo images capture 2 images tilted eucentrically at x degrees. Open both at the same time in Quartz PCI. Under Process tab, select the Stereo Pair command and pick left and right images from the drop down list, as well as the red/green or red/blue stereo image you want. Click on the Align tab on adjust the alignment of the stereo pair with X and Y sliders. Click OK to obtain a new stereo image with the intersecting region of the original images.

Ending session

- Decrease V_{acc} gradually to 5Kv, and switch off
- Move stage to Home Position Z65
- Air the chamber (not less than 30sec after turning HV off)
- Take out your sample
- Close chamber door
- EVAC the chamber
- Turn off the IR detector (power off)
- Turn off the coolstage if it has been used
- Remove and Clean your stubs, or keep samples in the desiccator

**NEVER Shut down the PC computer controlling the SEM
Log out, and indicate usage on paper log sheet**