

Zeiss Gemini500 SEM – Quick START by Kennedy Nguyen (Troubleshooting guide in the end)

Before your session:

1. Book time on **Google Calendar** for the Zeiss Gemini500 SEM – “Name/PI” on your time slot.
2. Have your **samples ready on SEM stubs (grounded and conductive)**
3. Have gloves ready for placing sample into SEM chamber (remove gloves when typing or opening doors)

During your session:

1. **Sign in on Login-sheet (Name, PI, Start time, etc)**
2. **Check:** Check that the Microscope is “On” (Green light in front panel) and there is compressed air (pressure gauge should have a reading for the compressed air). If not, contact the IMF lab manager.
3. **Login to the computer** with your user account.
4. Click on **SmartSEM** and have the EM Server Load. IF there are any errors, let the lab manager know and write it in the comment section of the login-sheet.
5. Login using your UCMID and password
6. Vent the chamber (you will hear a sound when chamber is vented)
7. Using gloves, take out out the stage and insert your sample (use the sample changer tool to secure the sample (clockwise to tighten, counter clockwise to loosen) The stage screws are numbered.
8. Place the stage back in the chamber. Close the chamber and make sure the o-ring is not loose (you won’t be able to close the chamber if the o-ring is loose).
9. Pump the chamber
10. Check the vacuum is good (green check) and that the Gun is on (green check). The gun vacuum should be below $3.0e-09$ mbar, if not let the lab manager know. A bakeout is required when the gun vacuum is 5 to $9e-09$ mbar.
11. Switch to chamber view (press camera on the keyboard, or using the software menu for Chamber scope/Detector)
12. Initialize stage if required. Move your sample close to the detector by using the z control to slow move it close to the blue line (in Stage Navigation Bar menu) or your desired working distance (WD). **Do not let your sample hit the detector!!**
13. Turn on the EHT with your desired voltage. Generally use Resolution mode with InLens Detector.
14. Switch to detector view by pressing camera on the keyboard or using the software menu icon for detector view. Adjust the brightness and contrast as needed.

15. Find a area of interest (you can use the stage controls to move, click on the stage navigation bar, or use "TAB+Ctrl" with mouse click to move on your sample).
 - a. If you can't find you sample, use Low Mag or Fisheye mode (SE2 detector only)
 - b. Adjust the contrast and brightness in Low Mag and Fisheye mode to view your sample.
 - c. When you find your sample, you can switch back to Resolution mode for imaging
16. Focus your sample (Coarse and Fine). "Tab" on the keyboard is a shortcut to toggle between coarse and fine for all controls (focusing, aperture centering, and stigmators)
17. Center the aperture with the wobble (Image should not shift and stay centered when corrected)
18. Fix Astigmatism by increasing the magnification (usually above 1000x) and sharpen the image. Treat Stigmator X and Y as extra fine focus. Get your sharpest image. If stigmation is fixed, when you go in and out of focus (the image should not stretch)
19. Repeat the focus, aperture, and stigmation correction until you get the best image.
20. Click on "5" (Frame Int7/Frame Int8) or your preferred scan rate for imaging. Right click to save as. For repeated imaging, you can pause the image on end and click on "SAVE TIFF" icon.
21. Increase the scan rate again when moving around your sample.
22. A shortcut to move around is "TAB + Ctrl" then mouse right click to move where you want to go (change magnification as necessary). To select a specific magnification, click on the "Mag" in the datazone and input your desired magnification.
23. Image as you need and fix focus, aperture, stigmators as necessary.
24. When done imaging, turn off EHT.
25. Vent the chamber.
26. Remove your sample. Remember to use gloves.
27. Pump the chamber. (Make sure it's completely pumped before closing the software)
28. Close the SmartSEM program, THEN close the EM Server (wait for the server to close itself)
29. Save your files (google drive, imf-lab03 server, dropbox, etc)
30. Logout of the computer.
31. Sign off on the log sheet. Report any issues, otherwise put "ok".

For more advance usage, refer to the instruction manual located in the SEM room.

Starting system from Shutdown

1. Turn on the breaker switch
2. Turn the Microscope switch to on (back of microscope), this turns on the lights on the front panel.
3. Press the "ON" button on the front panel.
4. Login to the computer and click on SmartSEM
5. Login to the software
6. Vent the chamber
7. Pump the chamber
8. Turn on the gun when the vacuum is ready
9. Initialize the stage

Shutting down the instrument

1. Turn off the EHT and turn off the Gun(if possible).
2. Close the SmartSEM program and EM Server.
3. Log off the computer
4. Press the "OFF" button in front panel of the microscope.
5. Turn the microscope off on the back panel of microscope.
6. Turn off the compressed air.
7. Turn the breaker switch down (off position)

Troubleshooting Common Errors for Zeiss Gemini500 SEM

Common Errors	Cause	Solution
"Stage Not Initialized"	Stage isn't initialized	Initialize Stage after logging into SmartSEM software
Sample Chamber fails to vent	Compressed air off	Make sure compressed air is on.
"Error Initializing EM Hardware"	Logging out of computer without closing SmartSEM or EM Server Program	Close software. Reboot computer and log back in.
"EM Server Hardware not found". SmartSEM initialization fails.	Shutting down computer without closing SmartSEM and EM Server Program.	Close software. Shutdown computer, set SEM to Standby (Front panel). Turn SEM back to "ON". Reboot computer and login.
Sample Chamber door does not completely close	O-ring for chamber is loose	Secure O-ring on chamber door, then close door gently.
Can't login to SmartSEM program, only one instance can be used at a time	Previous user did not logout of SmartSEM program	Have the previous user logout. If not possible, then restart the computer (forced logout), then log back in.
Touch alarm activated, Chamber is beeping	User accidentally touched a component in sample chamber	Close the SmartSEM program and EM Server Program. Restart them both.
Communication error, cannot connect to stage. Please check hardware. Water temperature too low. Initialize Stage does not work.	SEM has been turned off for too long or a power interruption has occurred when it was on standby.	Close Software. Shutdown computer. Put SEM to "OFF" (Front panel). Demagnetize SEM by turning it OFF (Back panel). Turn the SEM back ON (back panel, then front panel). Reboot computer, login, restart SmartSEM and initialize stage.
Bad vacuum - Bakeout Needed	Gun Vacuum is higher than 5.0e-09 mbar	Ask Lab Manager to run Bakeout Overnight Procedure.

Please log the errors on the login sheet if they occur. If they can be resolved using this guide, please note this as well.