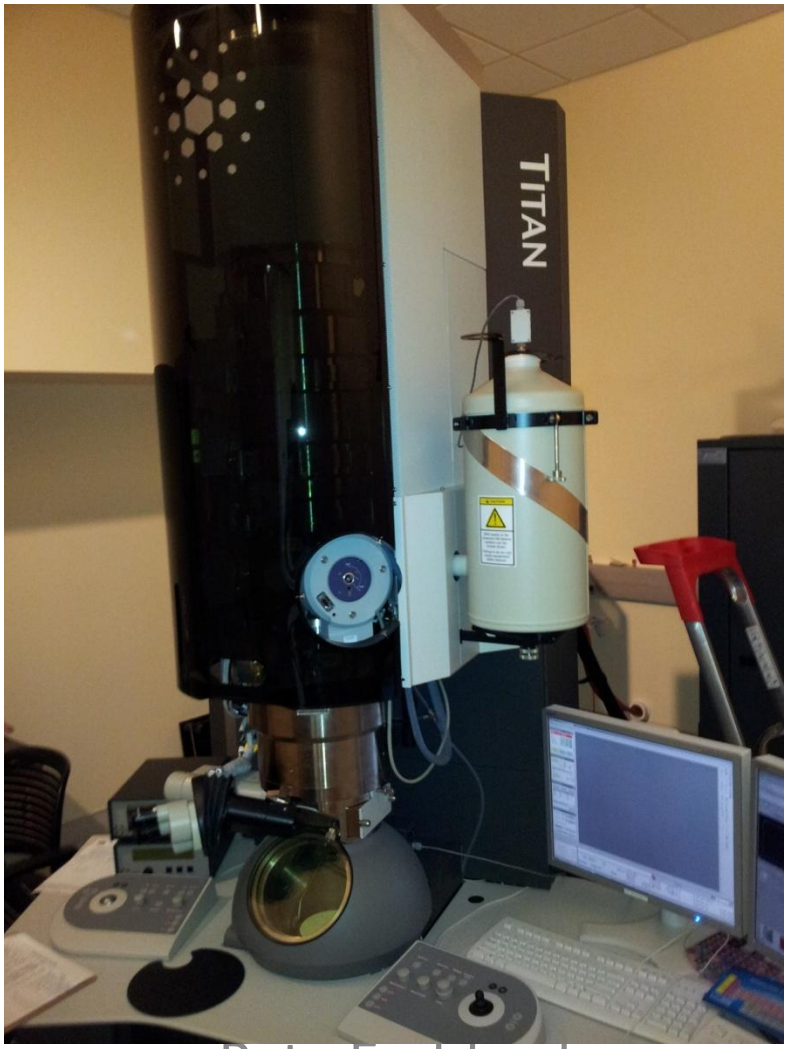
Titan Operation Manual

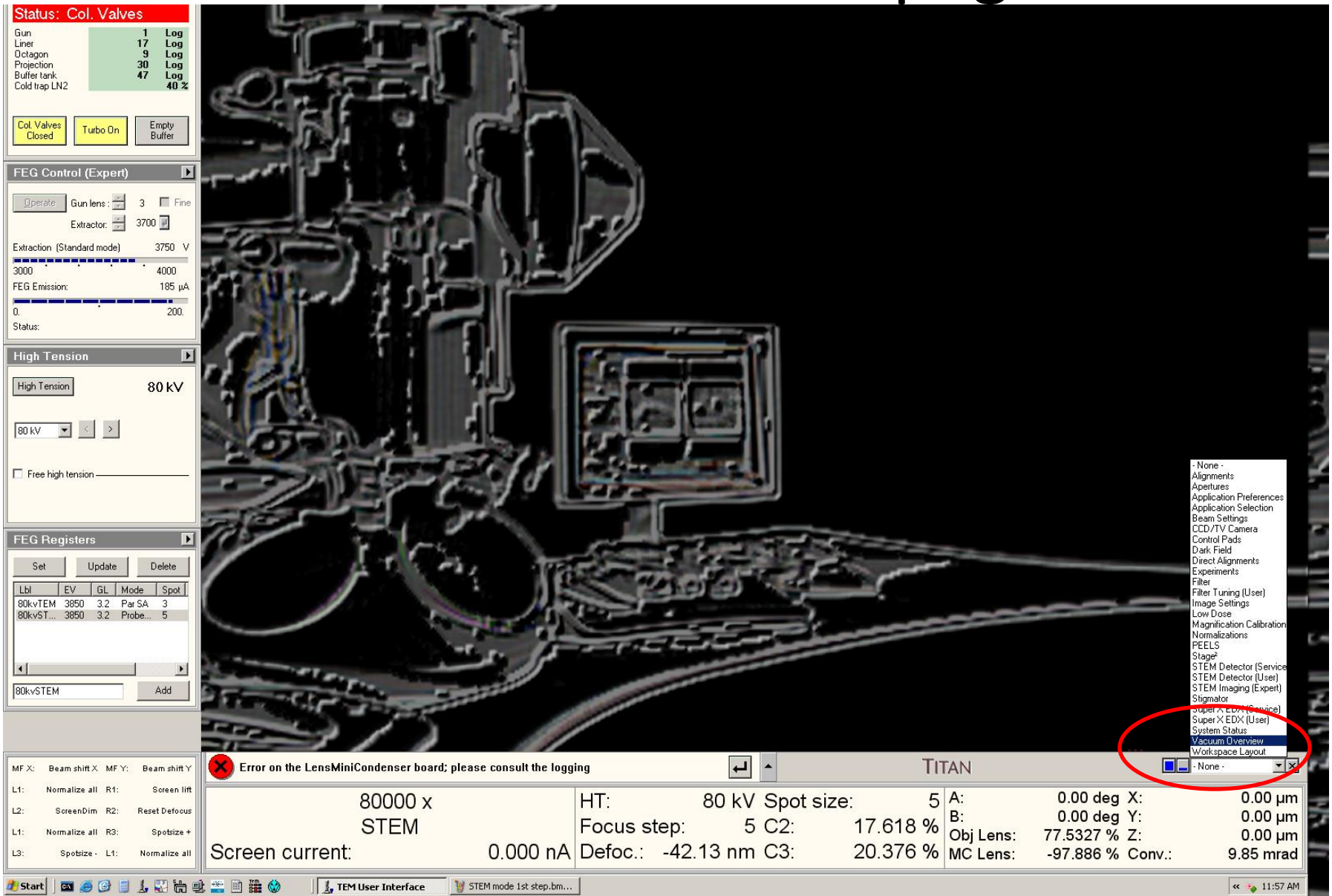


Pete Eschbach

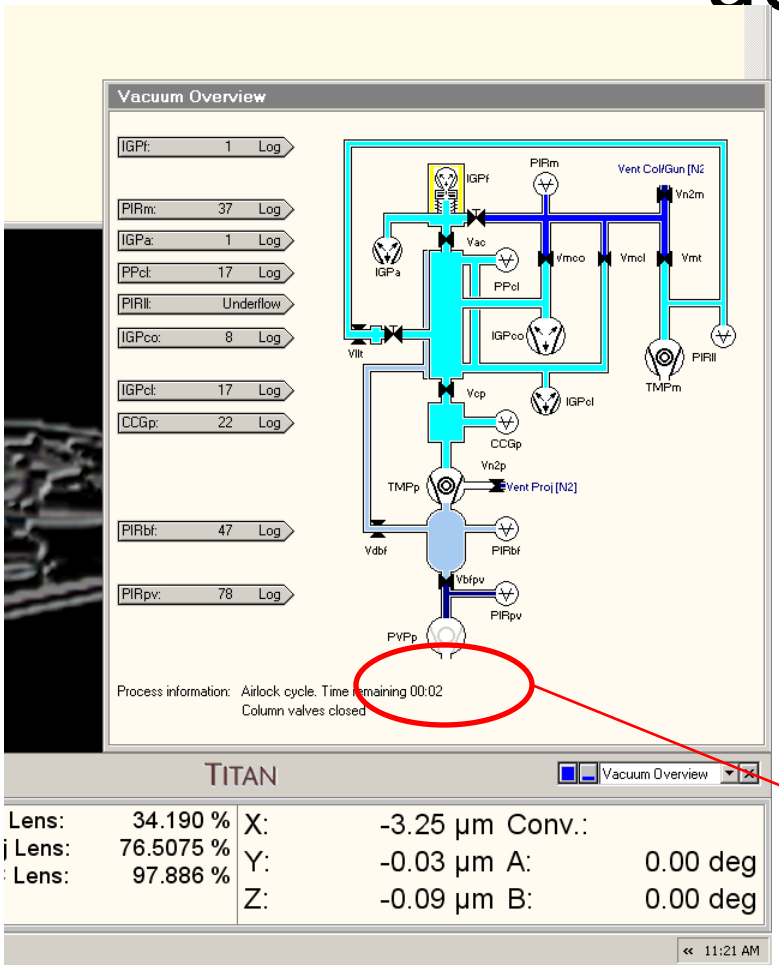
Linus Pauling Science Center

Oregon State University

Put Rod to first position and open the vacuum overview page

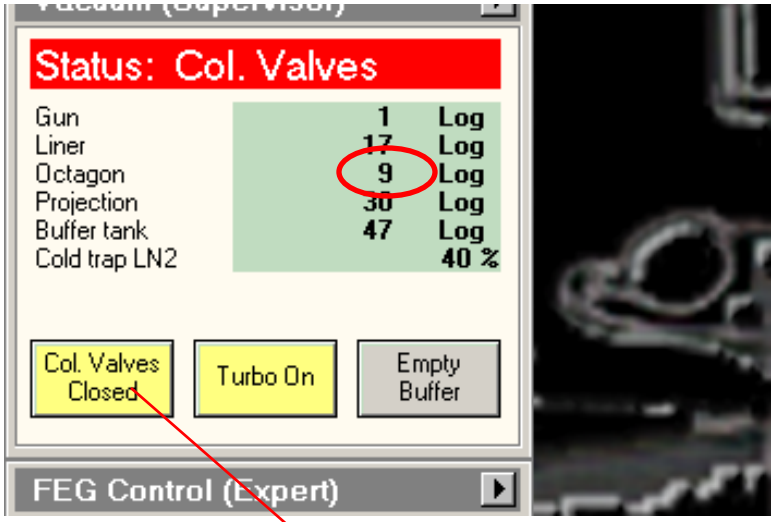


After Airlock Cycle Times Out, 5 minutes, Insert Sample Rod by turning CCW, Don't delay!



When time reaches 0, insert rod by turning Counter Clockwise and letting it gently into the Titan.

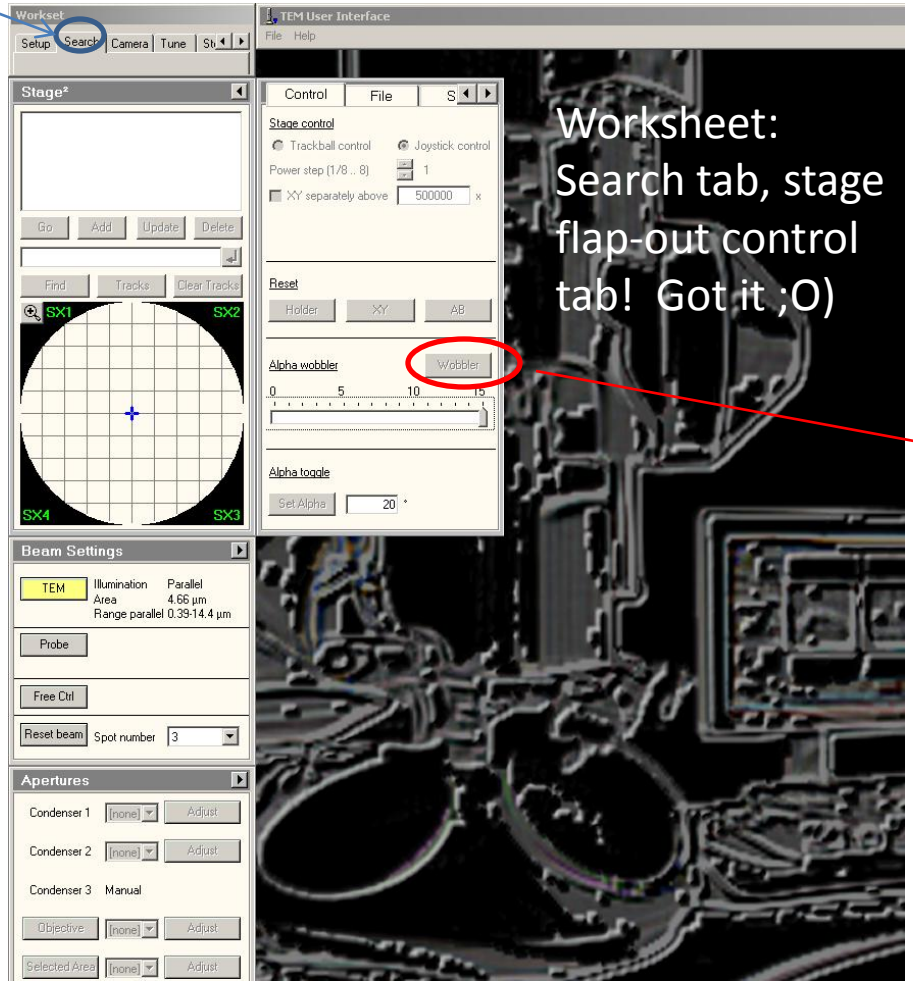
After inserting Octagon Pressure should be less than 25.



Now click on Col Valves Closed to turn on Beam!

Set Eucentric Height

Search



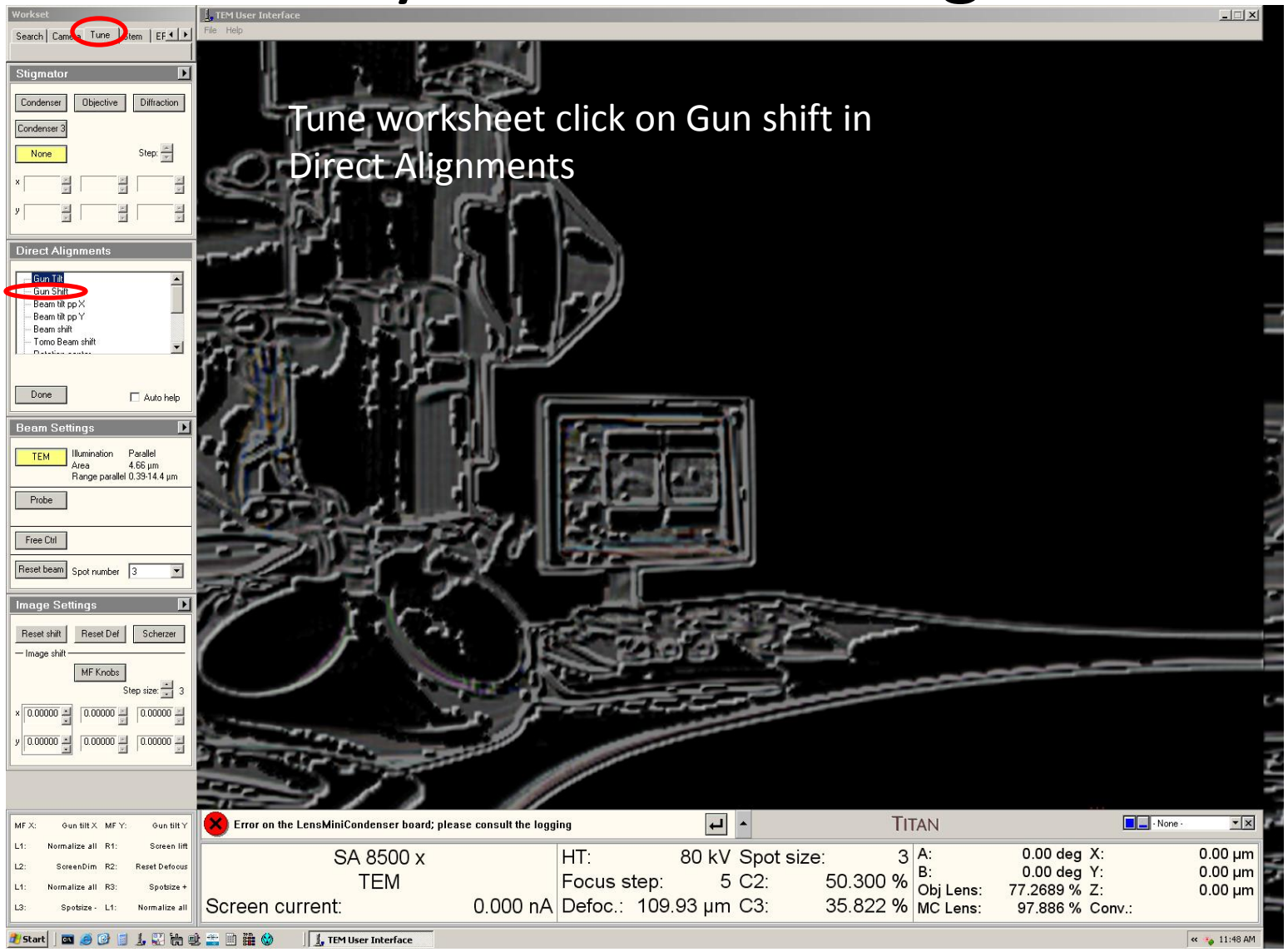
Worksheet: Search tab, stage flap-out control tab! Got it ;O)

Activate wobber and use Z controls on MUI to minimize motion induced by alpha wobble

Adjust Z height

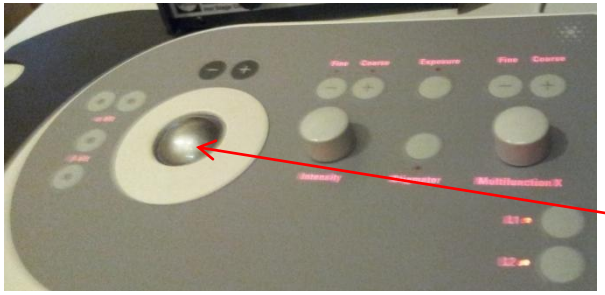
Right MUI, manual user interface

Now that Eucentric Height is set we are ready to do basic alignments



Beam and Gun Shift align*, we flip between spot 6 and spot 2

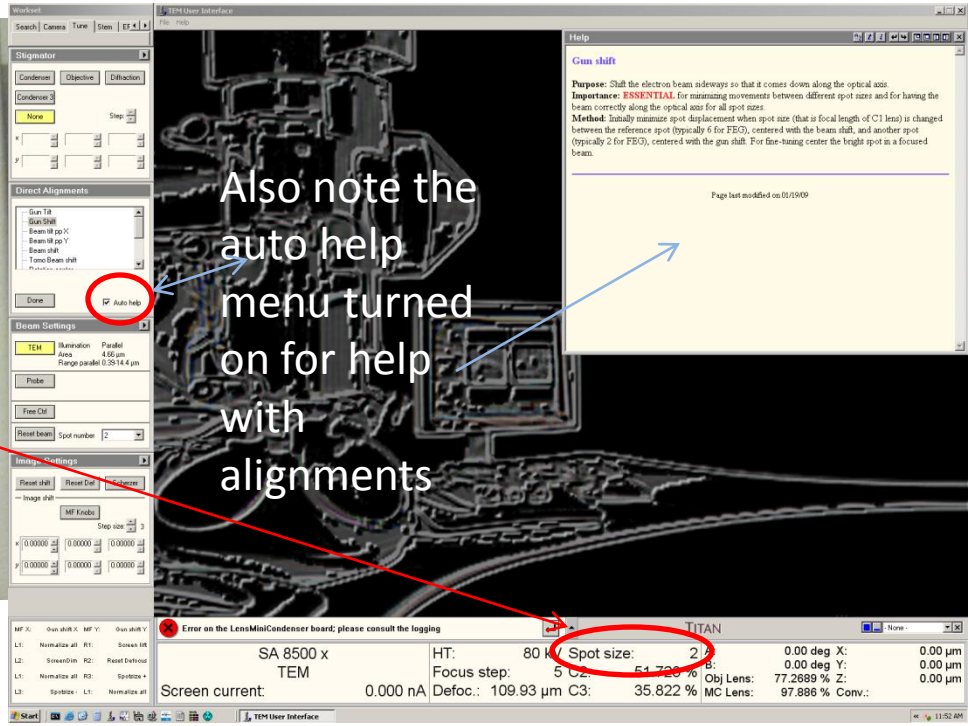
Adjust spotsize to 6 with Right MUI, R3

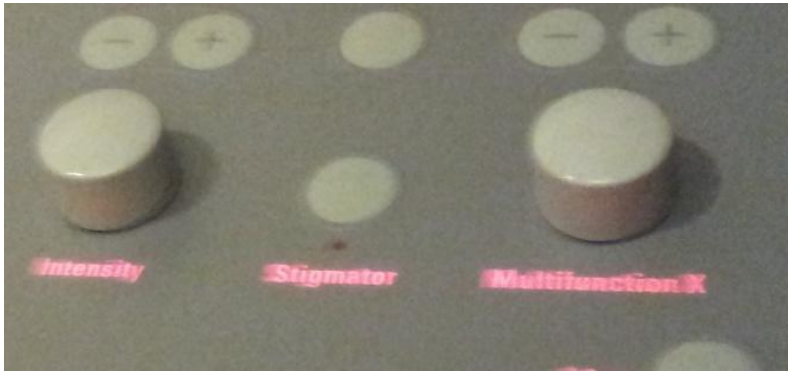


Now use beam shift on left MUI to center the beam on phosphor screen

*Gun Shift alignment is probably the most important as it sets the beam to go through center of apertures at top of column.

Gun Shift at spot 2

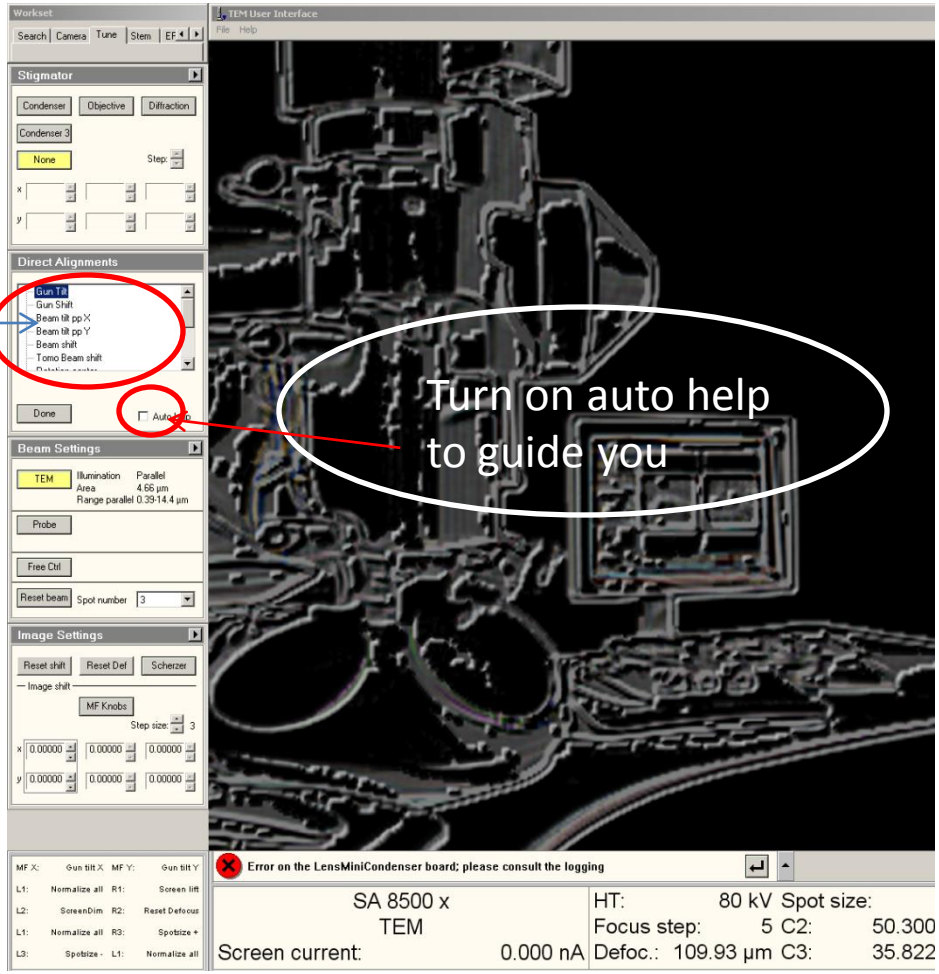




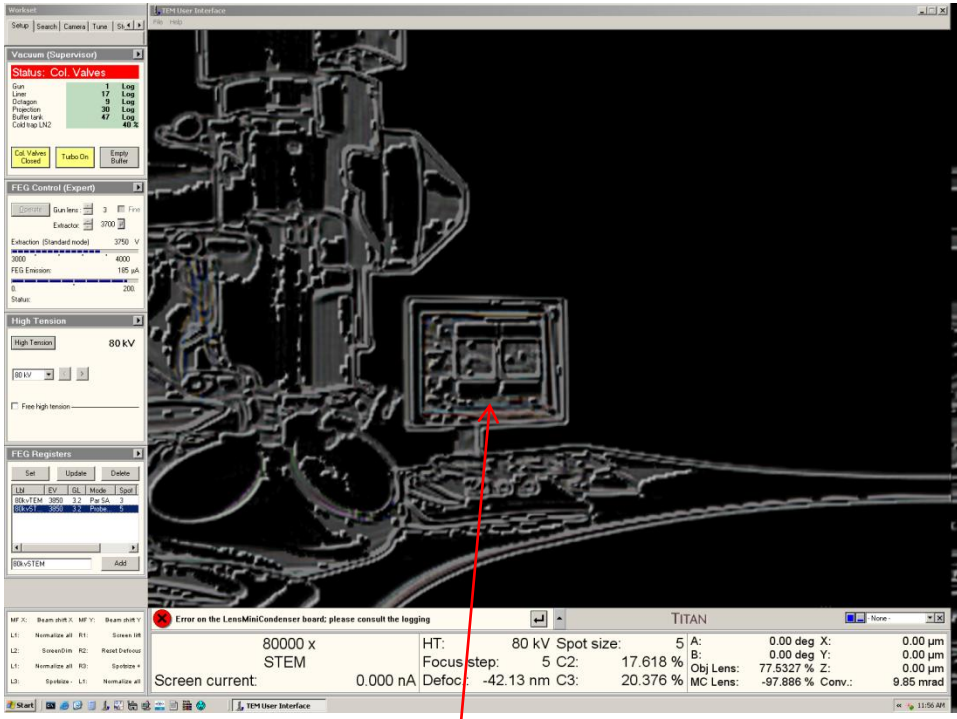
Computer auto assigns gun shift to Multifunction x and Multifunction y. Use MFx and Mfy to center beam at spot 2!

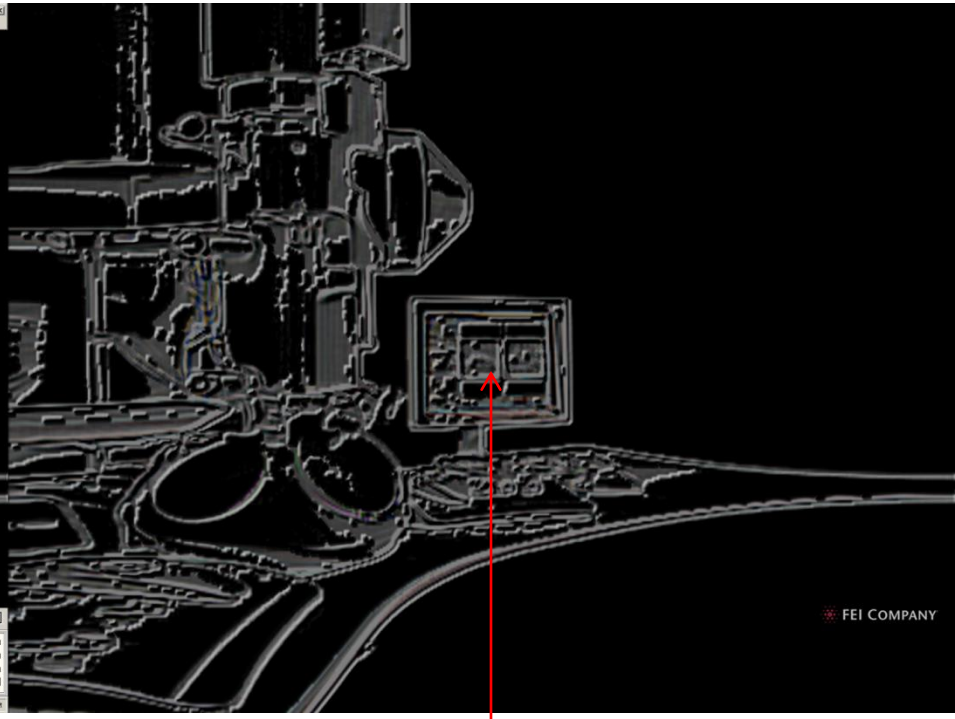
Now that we have the spot 2,6 (gun shift and beam shift) TEM alignments the others go quickly.

Step through all the alignments



STEM (Scanning Transmission Electron Microscopy) Overview





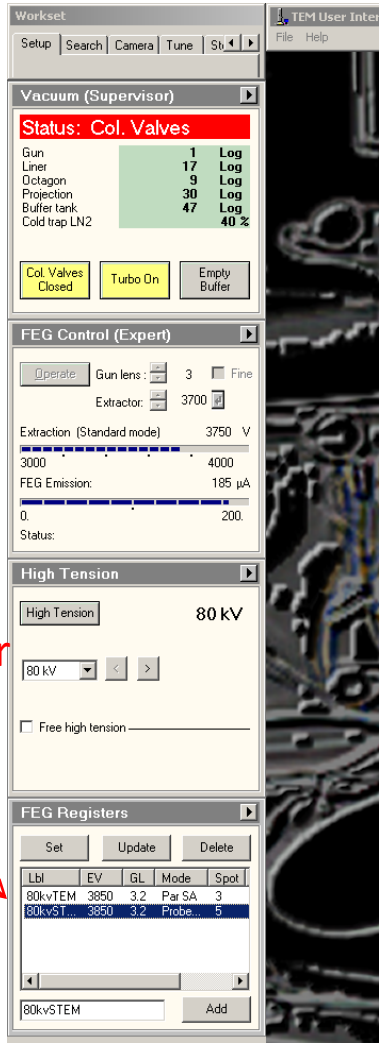
STEM images using TIA software will go here!

Chemical maps using the four Bruker EDS detectors will pop up on the second monitor over here!

Two monitors, same CPU and hard drive!

TEM to STEM steps 1, 2, 3

Step 1, set STEM register

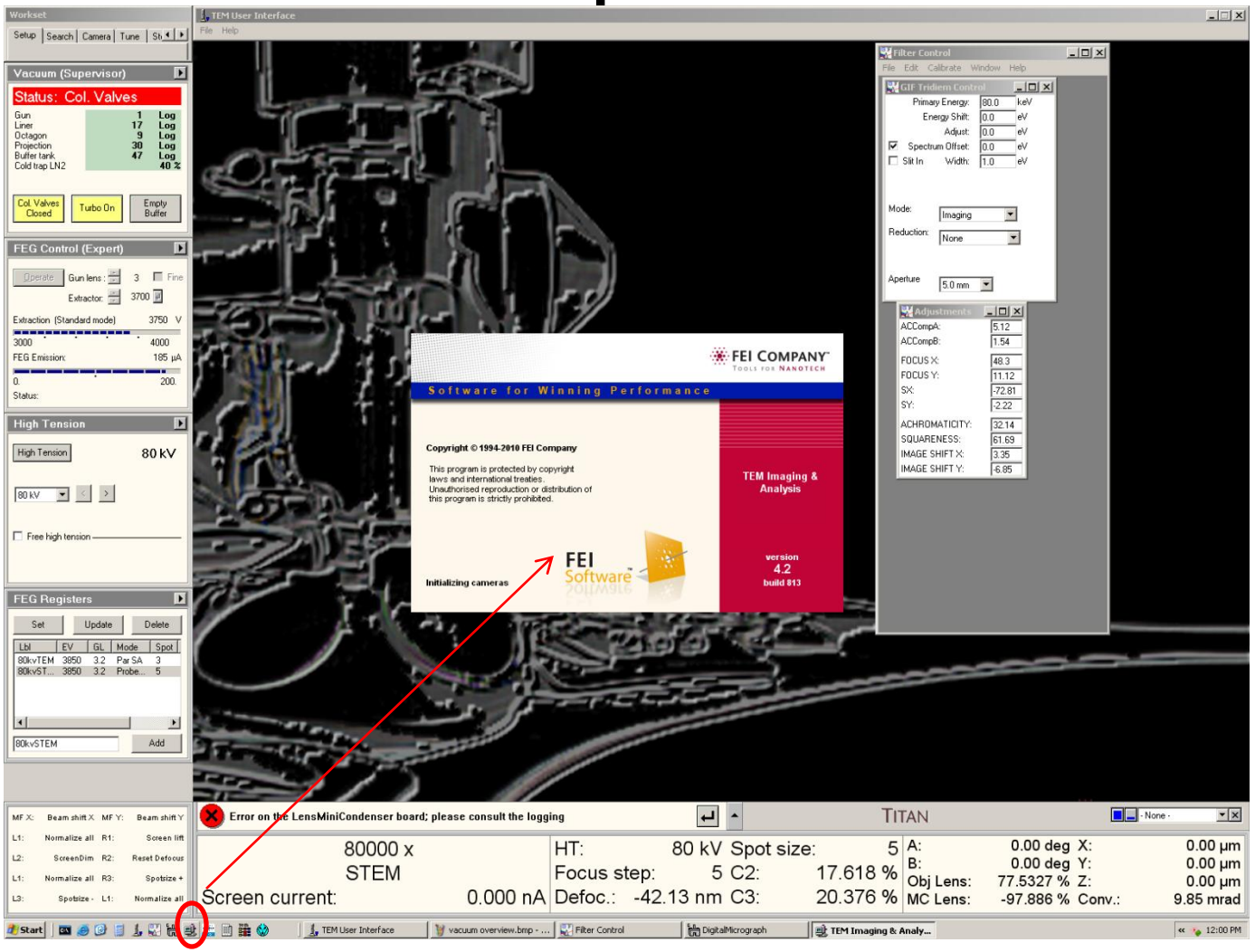


2) Go to STEM worksheet

3) Click on STEM

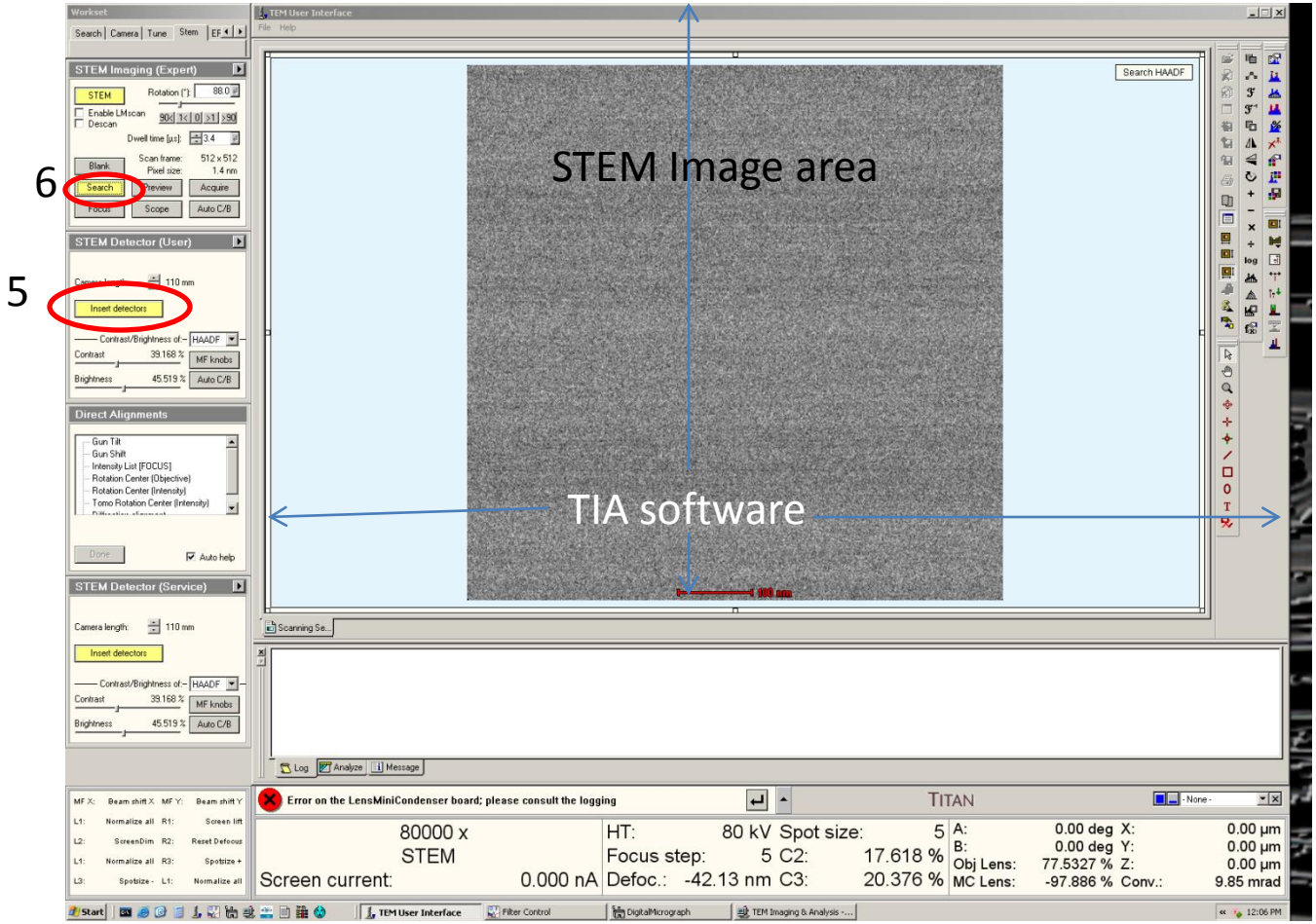
Mode at bottom of screen now says STEM!

Stem Step 4 Launch TIA

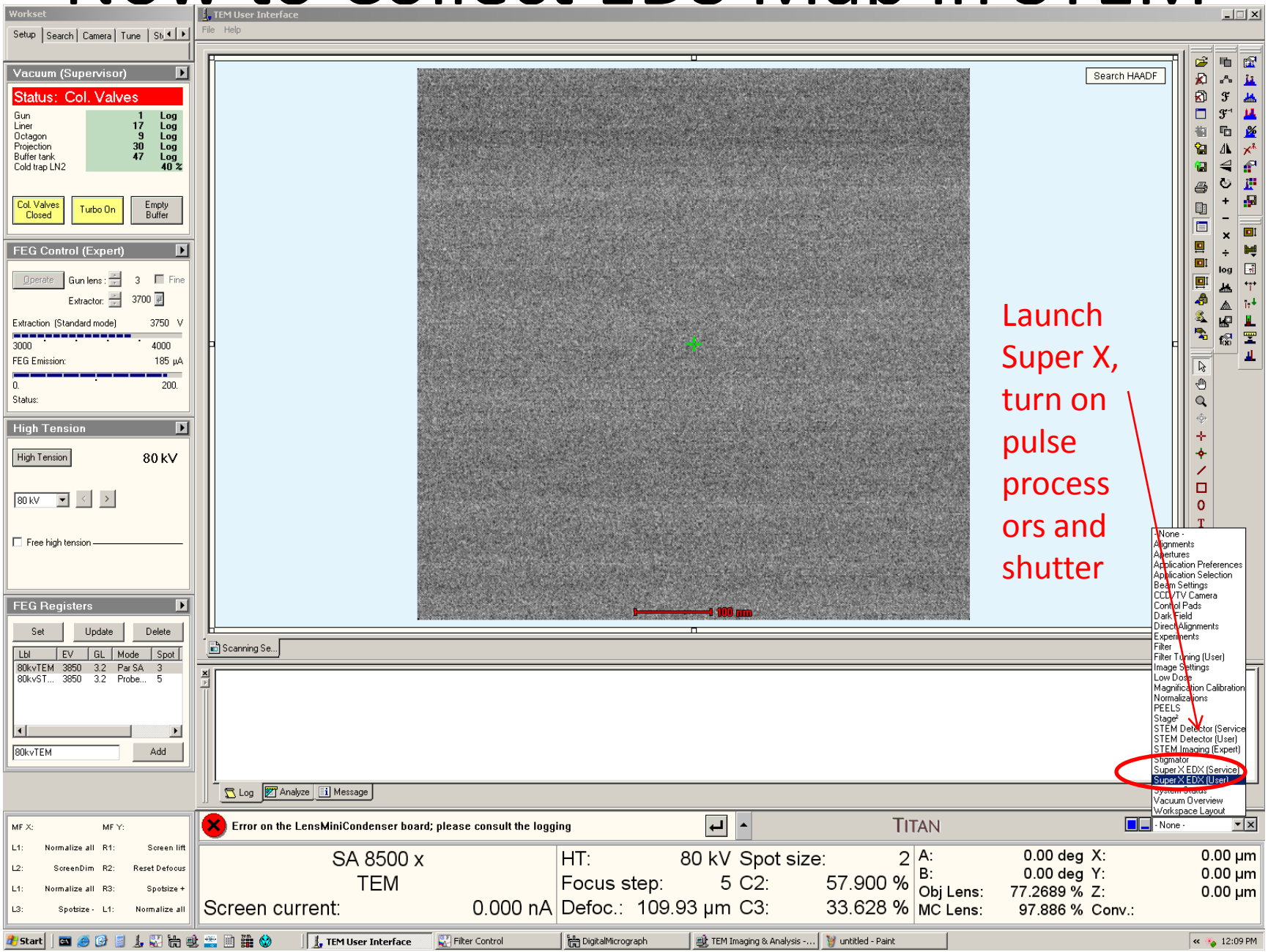


Launch TIA software

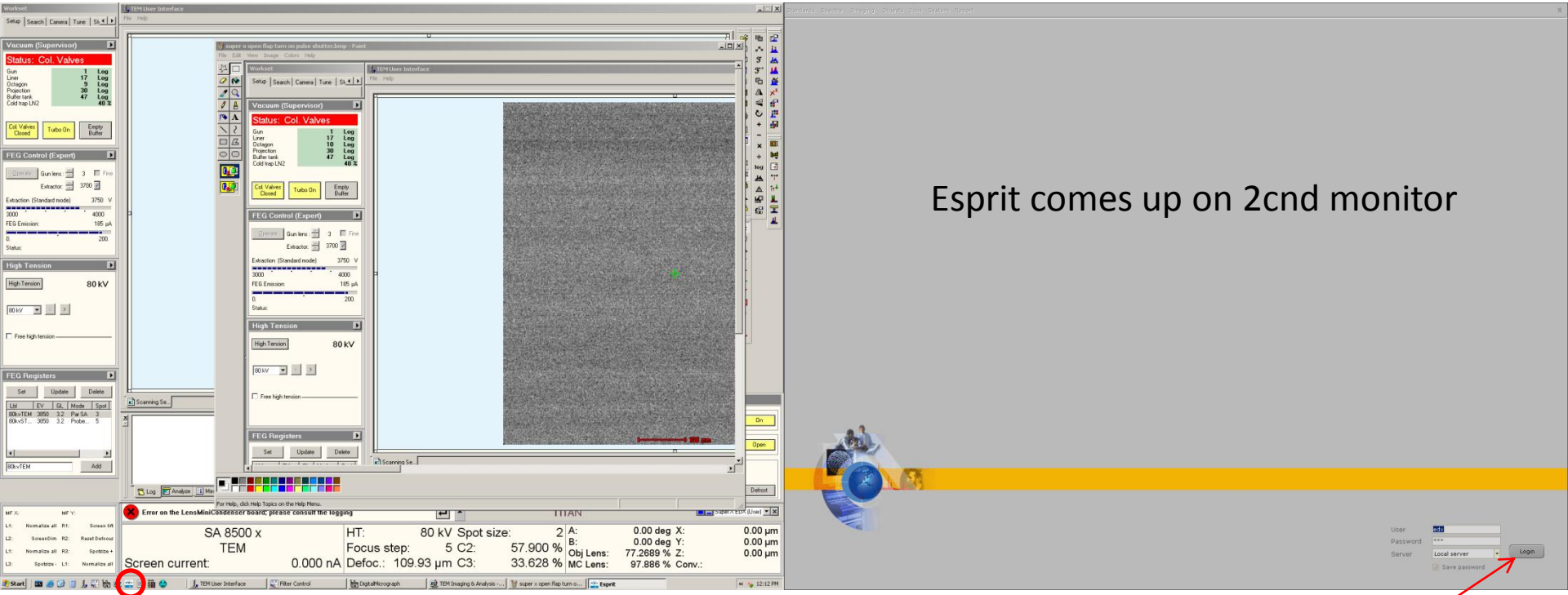
STEM Step 5 Insert detectors, 6 click search



Now to Collect EDS Map in STEM



Now Launch Esprit, Bruker Software to Collect EDS map.



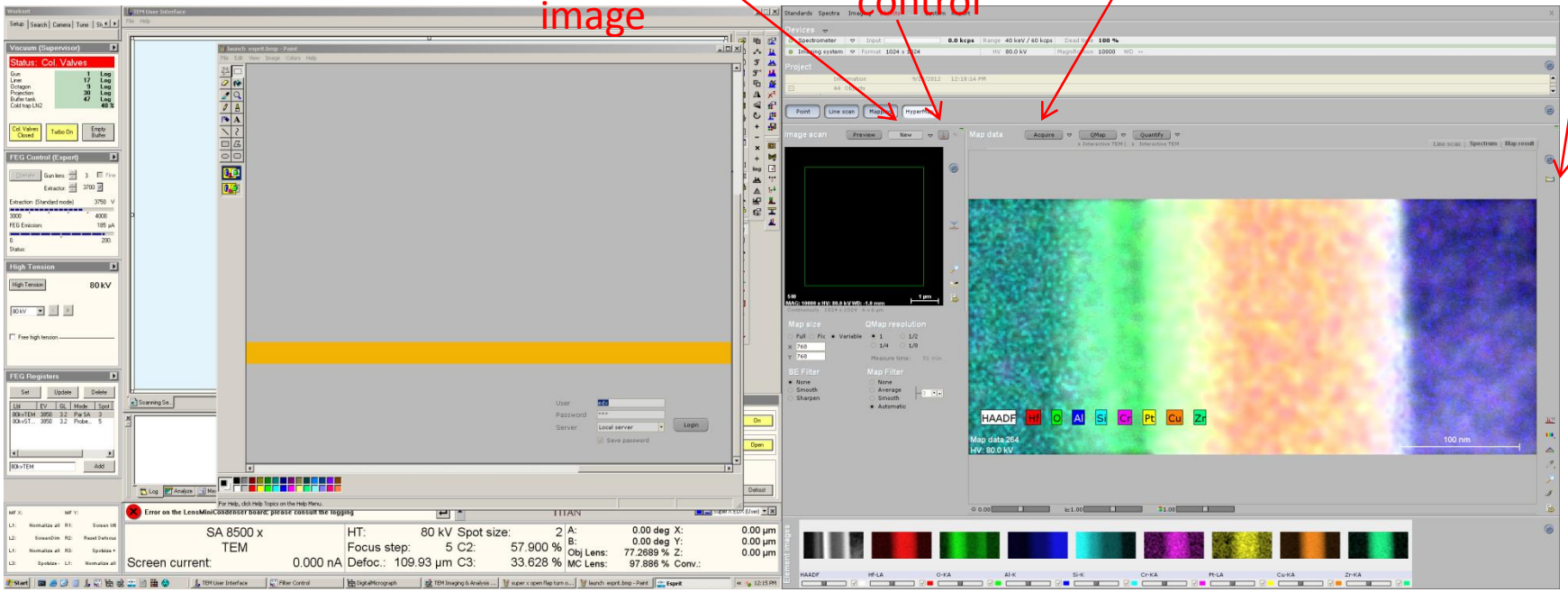
To Collect Map in Esprit

1) Collect new STEM image

2) Hit drift control

4) Click Acquire

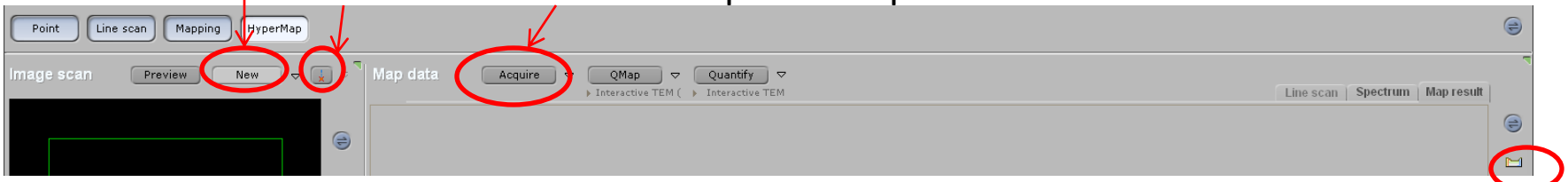
3) Select some elements in periodic table



New STEM

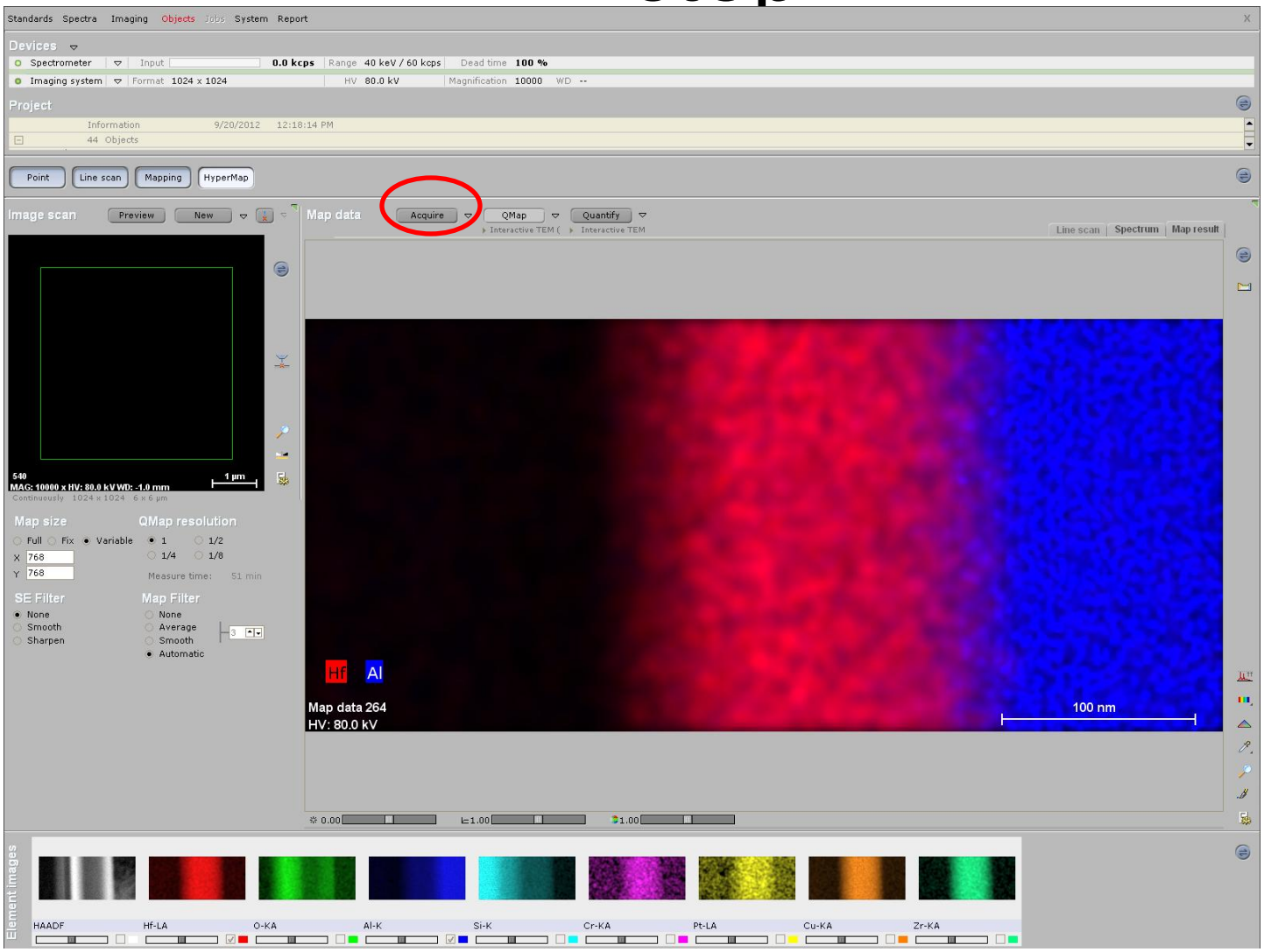
Drift

Start and Stop EDS Map



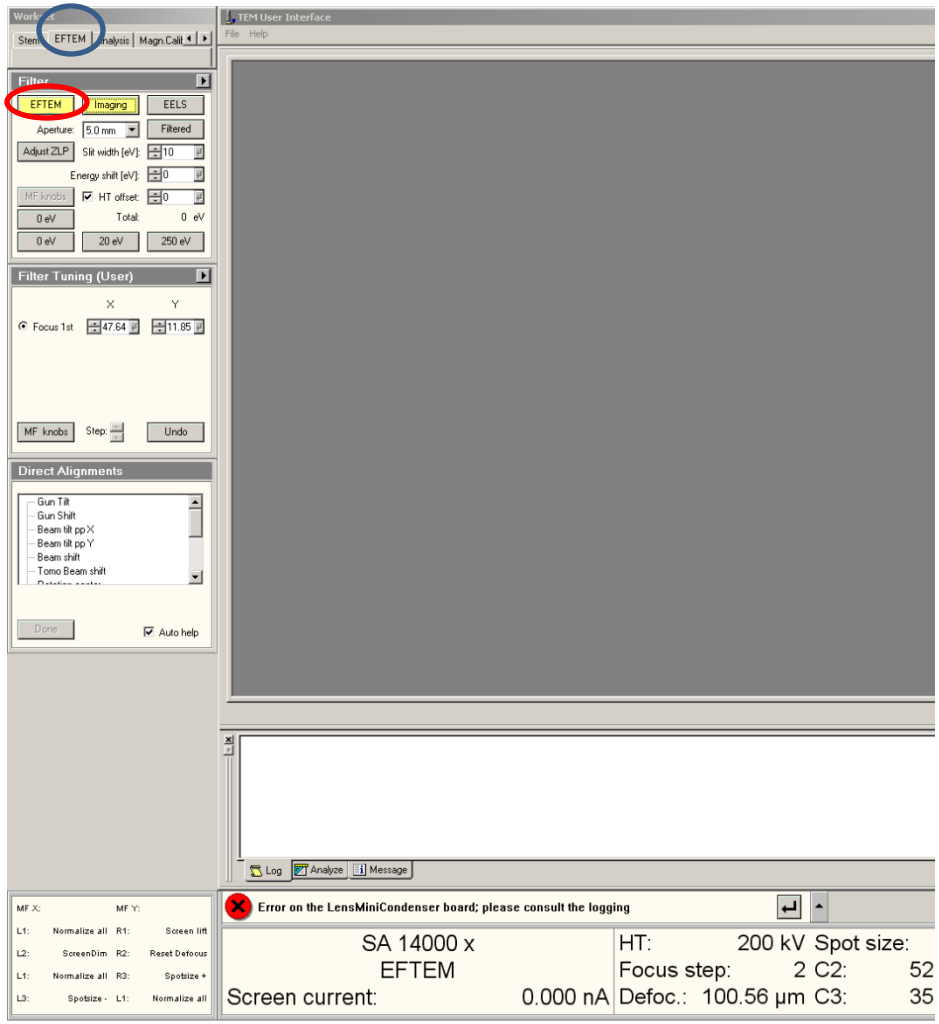
Periodic Table

Now mapping. Click Acquire again to stop



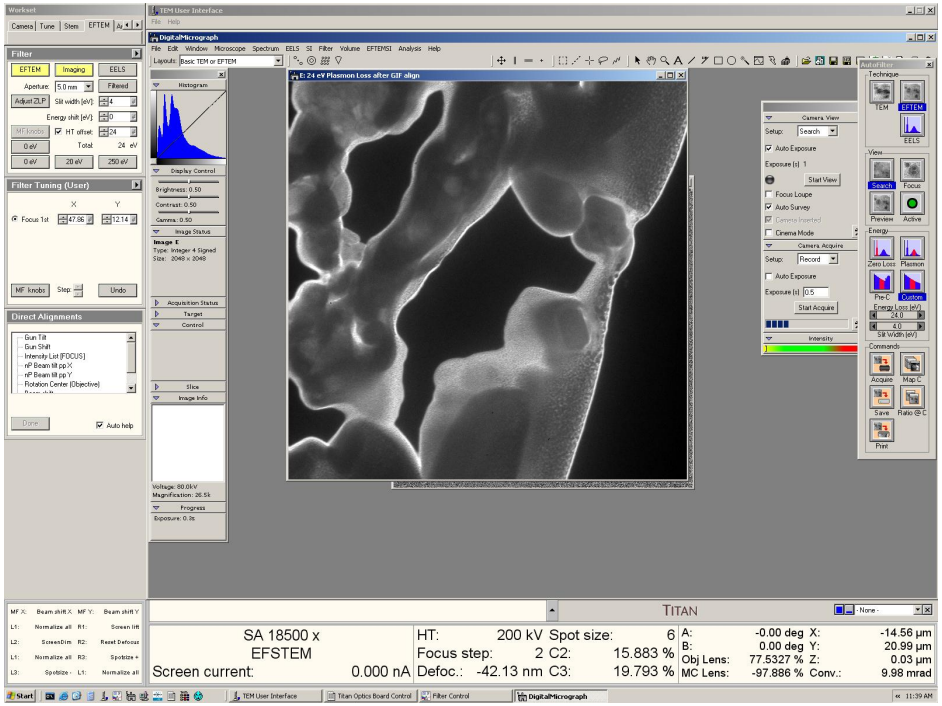
EFTEM: Go to EFTEM worksheet

1) Hit EFTEM button, this will raise phosphor screen and set projector lens strength for lower camera, Energy Filtered CCD – EF CCD.
2) Start digital micrograph

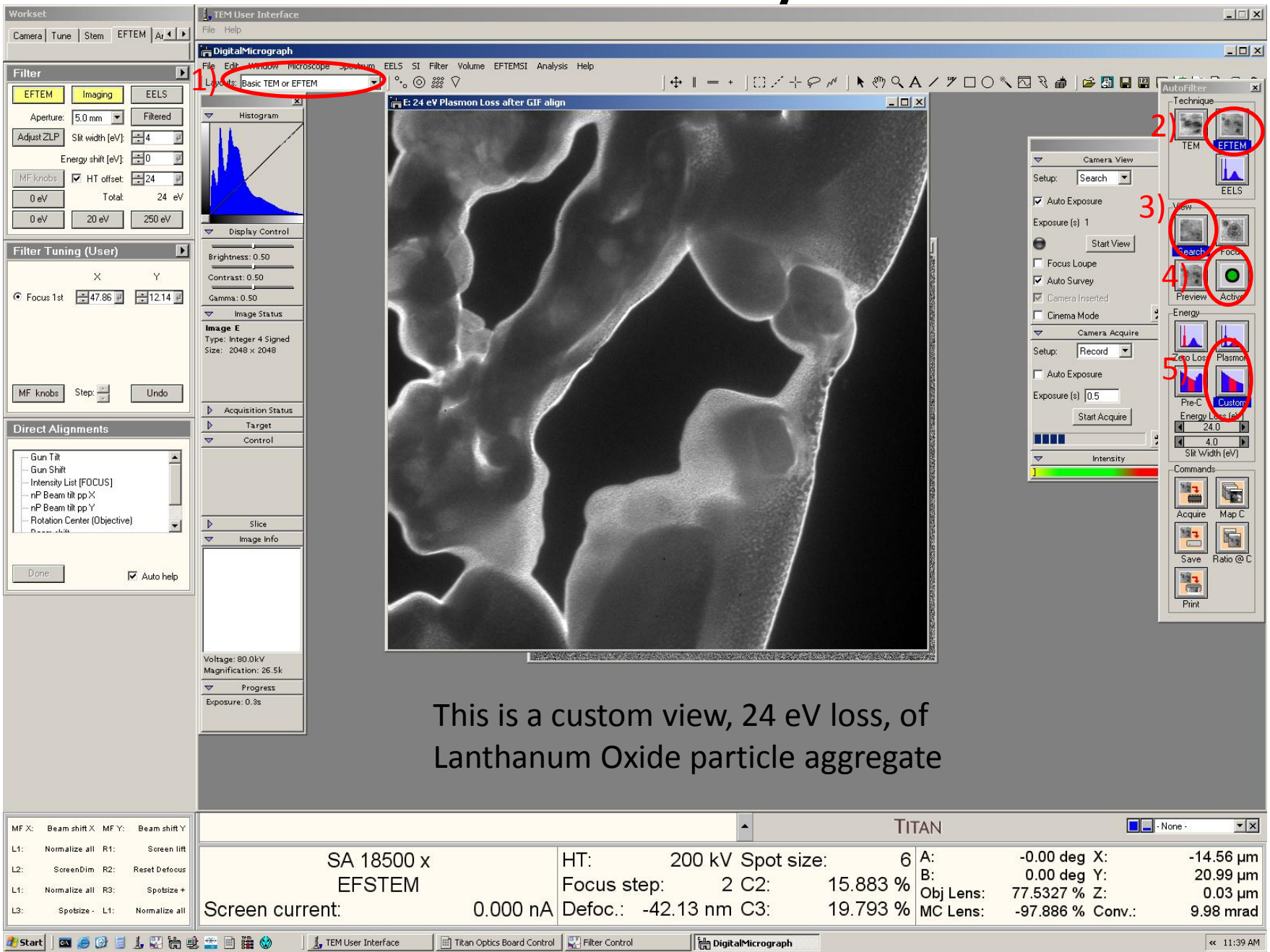


EFTEM Steps

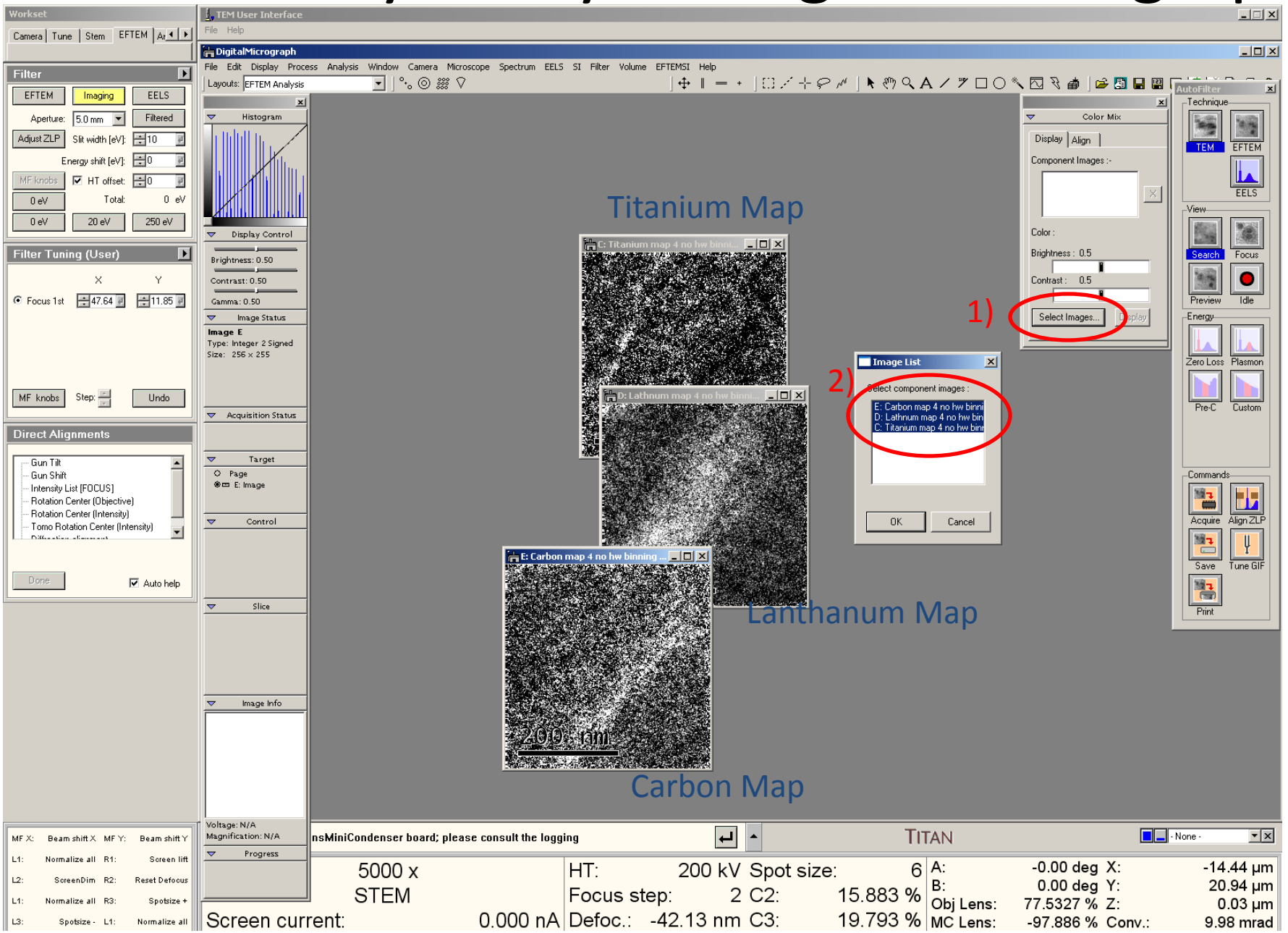
- Select EFTEM basic layout in DM
- Switch to EFTEM mode in Titan control
- Raise screen
- Select TEM in filter
- Hit search and active
- Now adjust mag and focus for EF – CCD with sample.
- Move to a hole, away from sample
- Hit tune GIF, you may have to adjust brightness via dialog, hit enter when done adjusting
- After tune GIF is done move back to your sample.
- Collect Zero loss, make sure focus is good.
- Now begin mapping



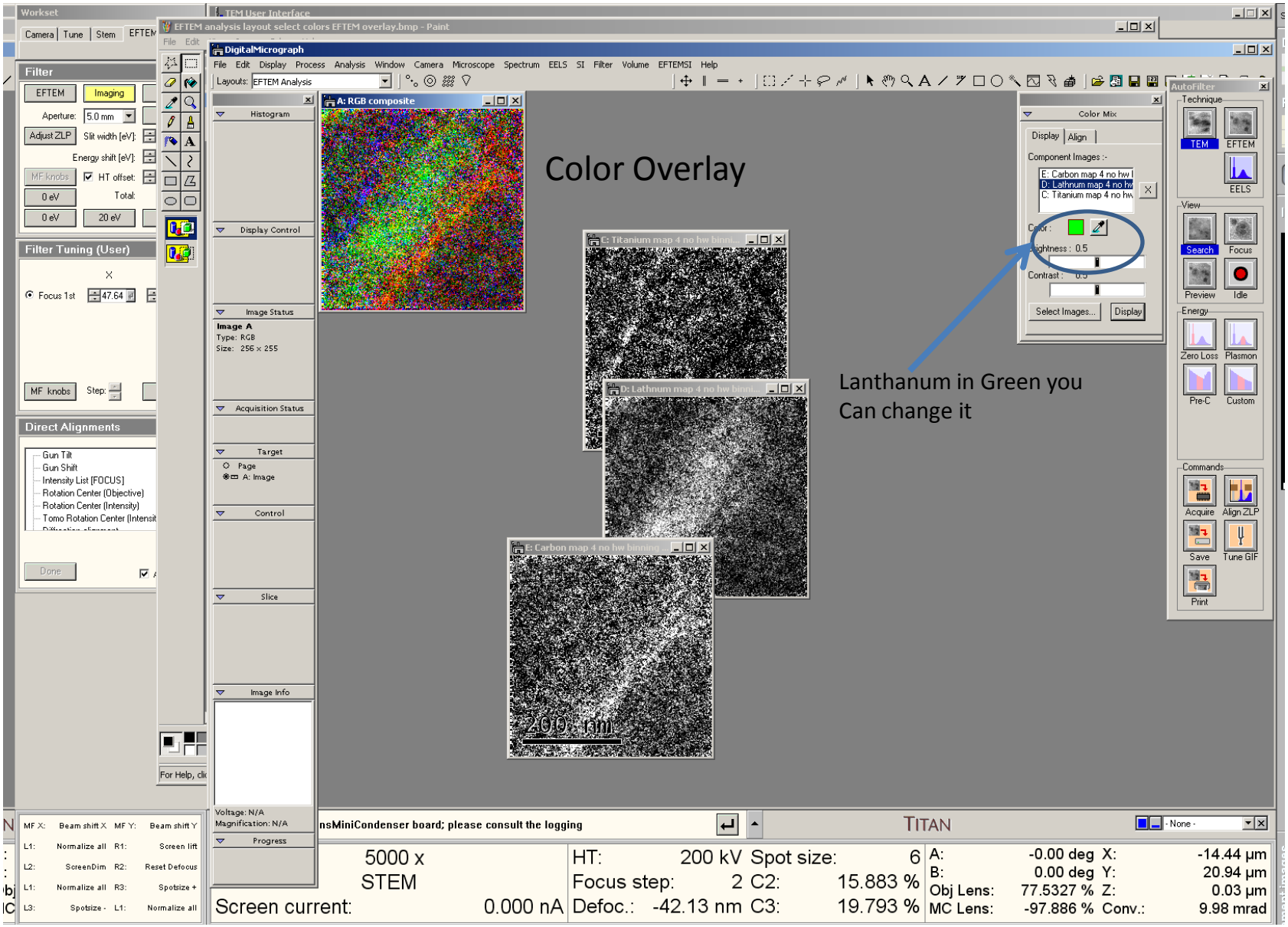
EFTEM basic layout



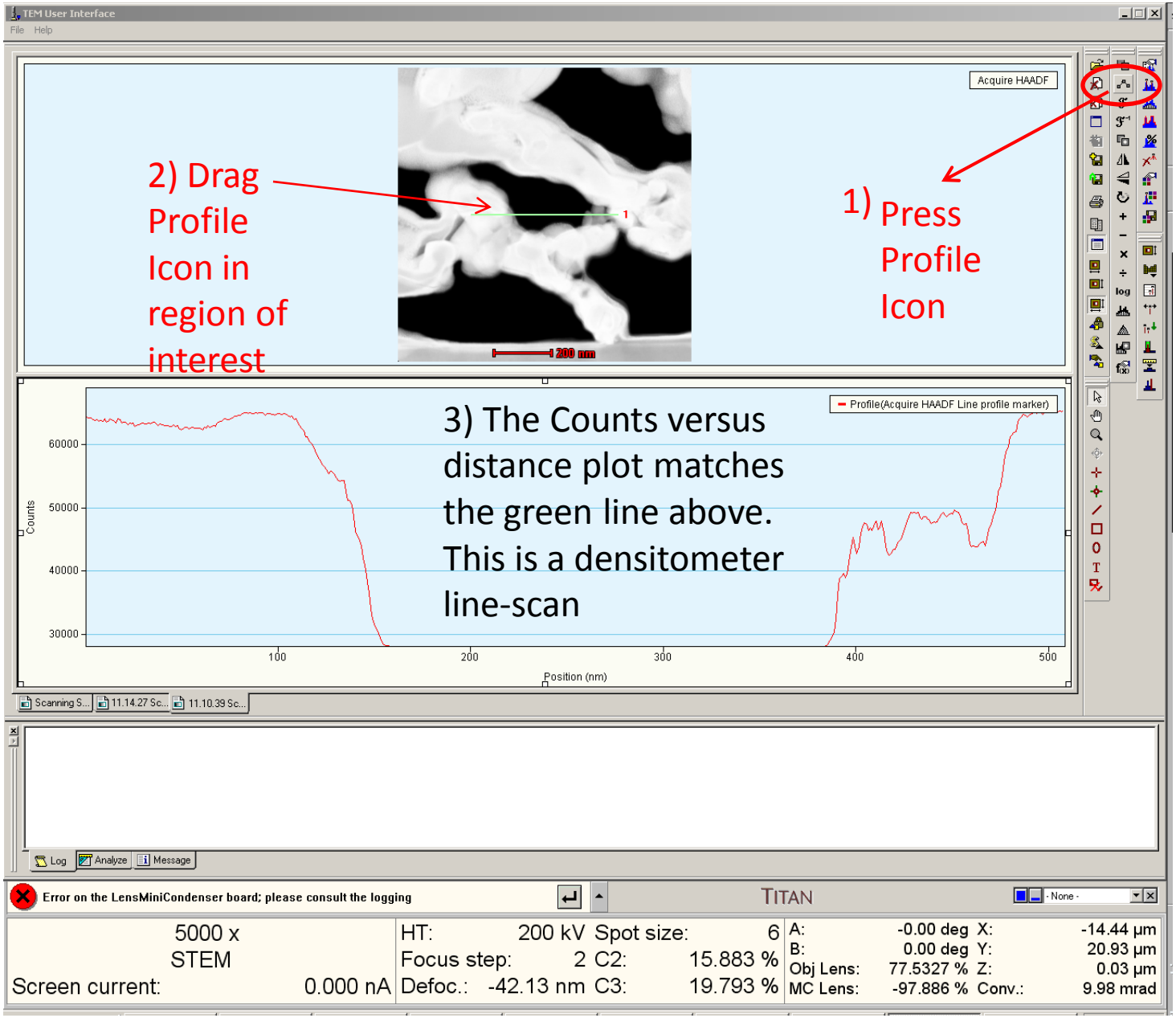
EFTEM Analysis Layout Digital Micrograph



EFTEM Analysis II, Color Map and Changing Colors

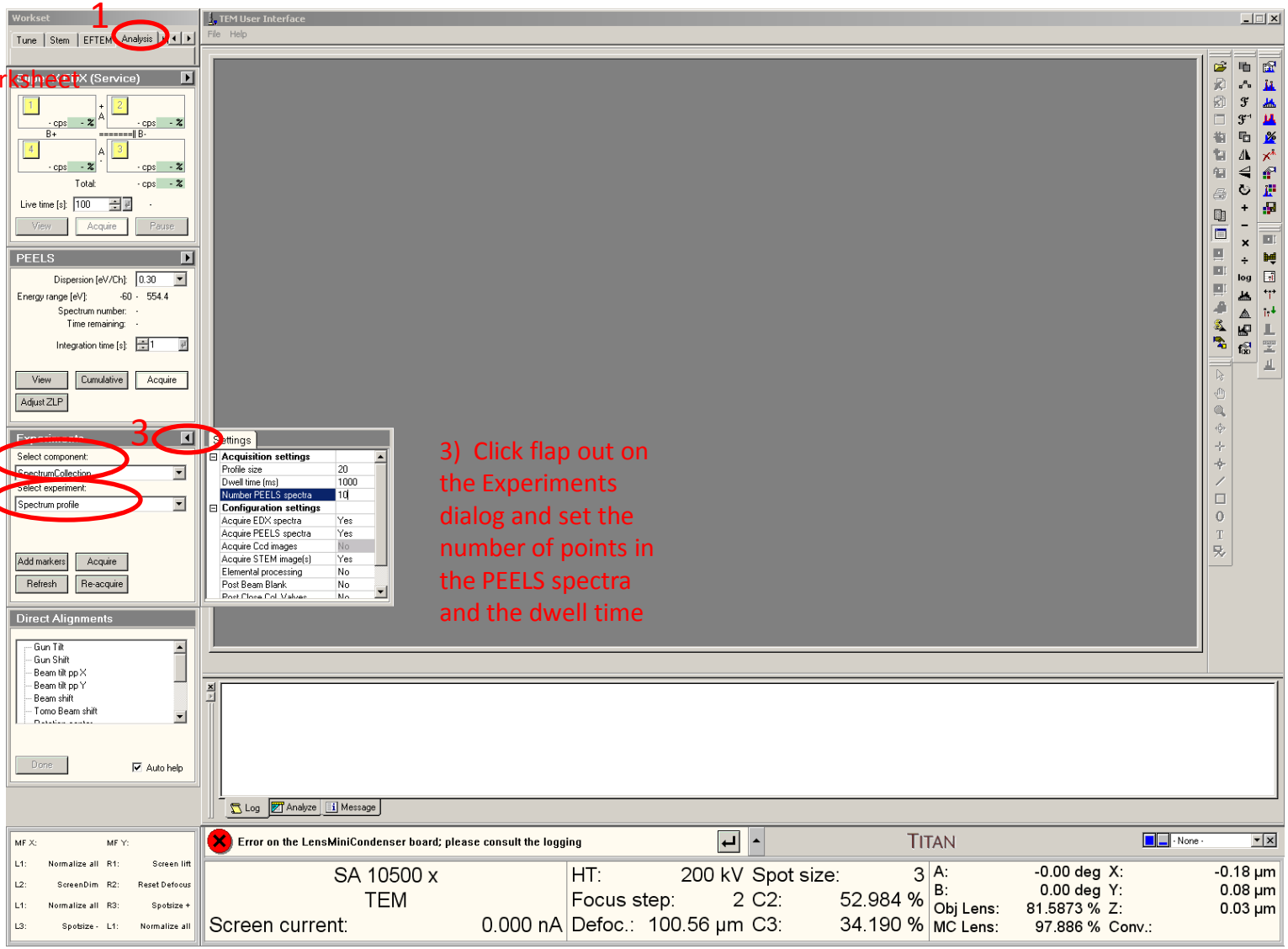


Advanced TIA Techniques: I. Profile of HAADF or Densitometer Line-Scan!



Advanced TIA Technique: II simultaneous EDX and EELS line-scan

1) Analysis Tab of EM Worksheet

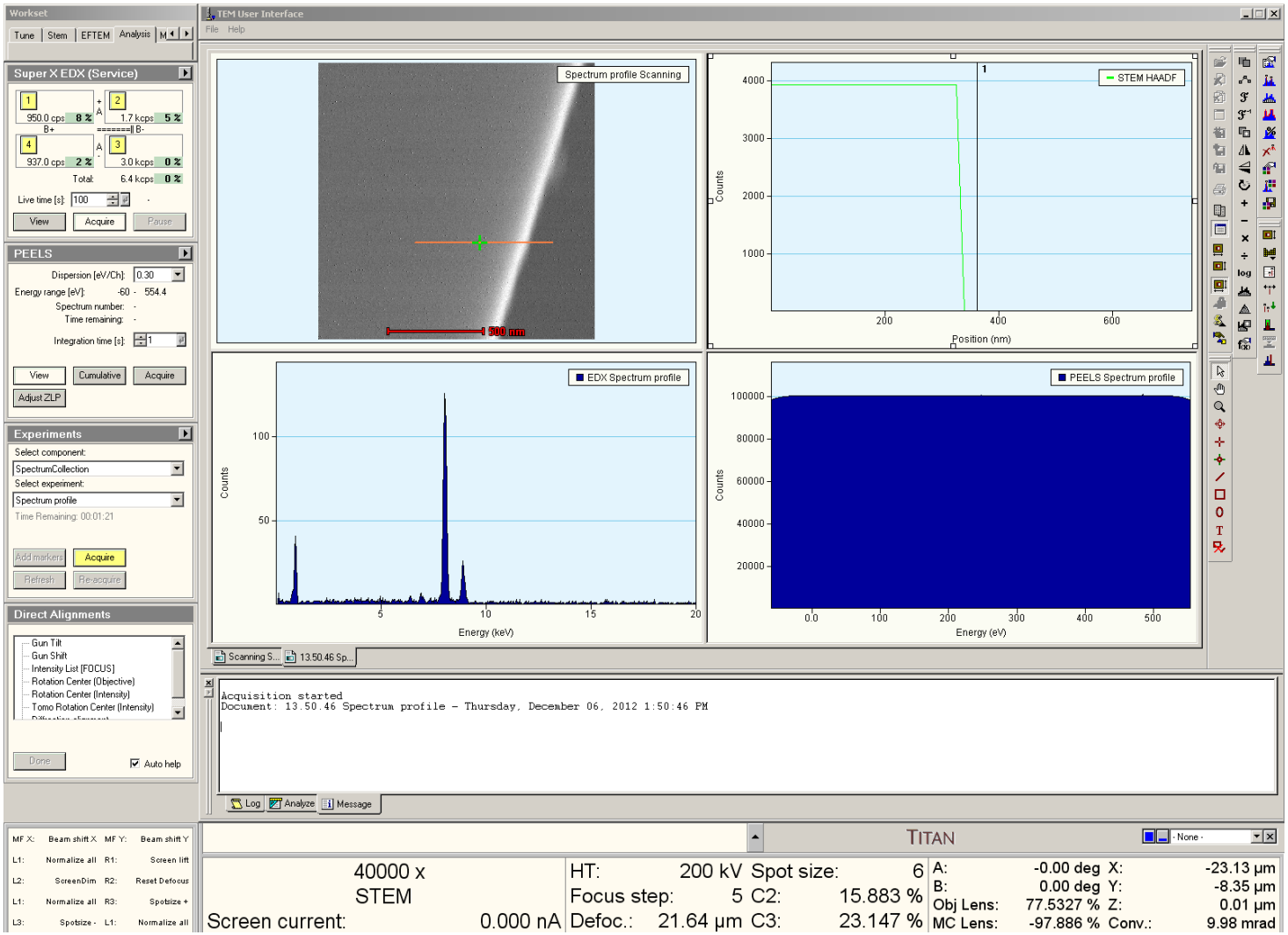


2) Select Spectrum Collection and Spectrum Profile in Experiments dialog

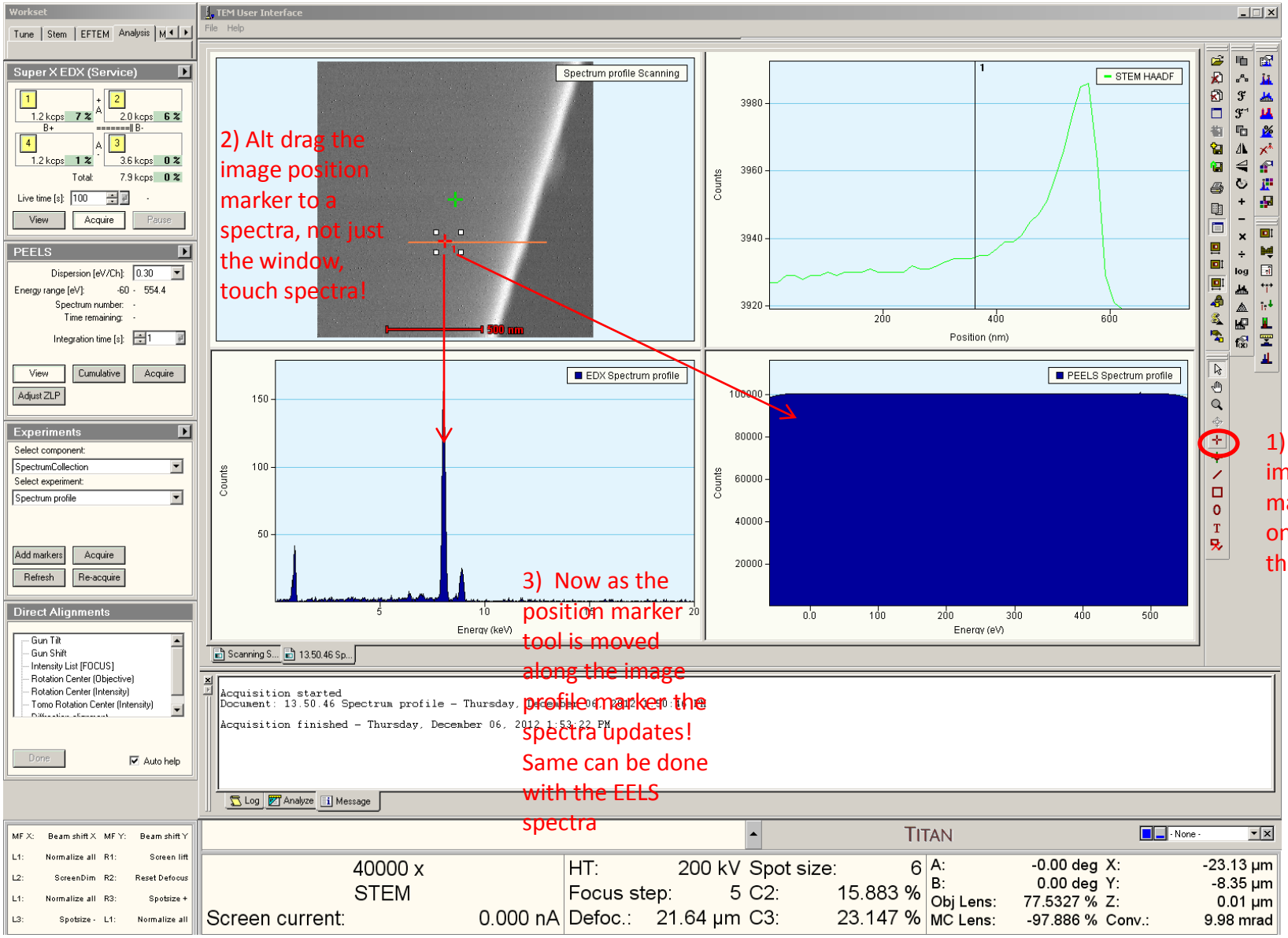
3) Click flap out on the Experiments dialog and set the number of points in the PEELS spectra and the dwell time

The HAADF detector has a hole in it and so we collect the energy loss electrons below while the EDX x-rays are collected above near the sample!

TIA Advanced Techniques: II continued
Simultaneous EDX and EELS Linescan

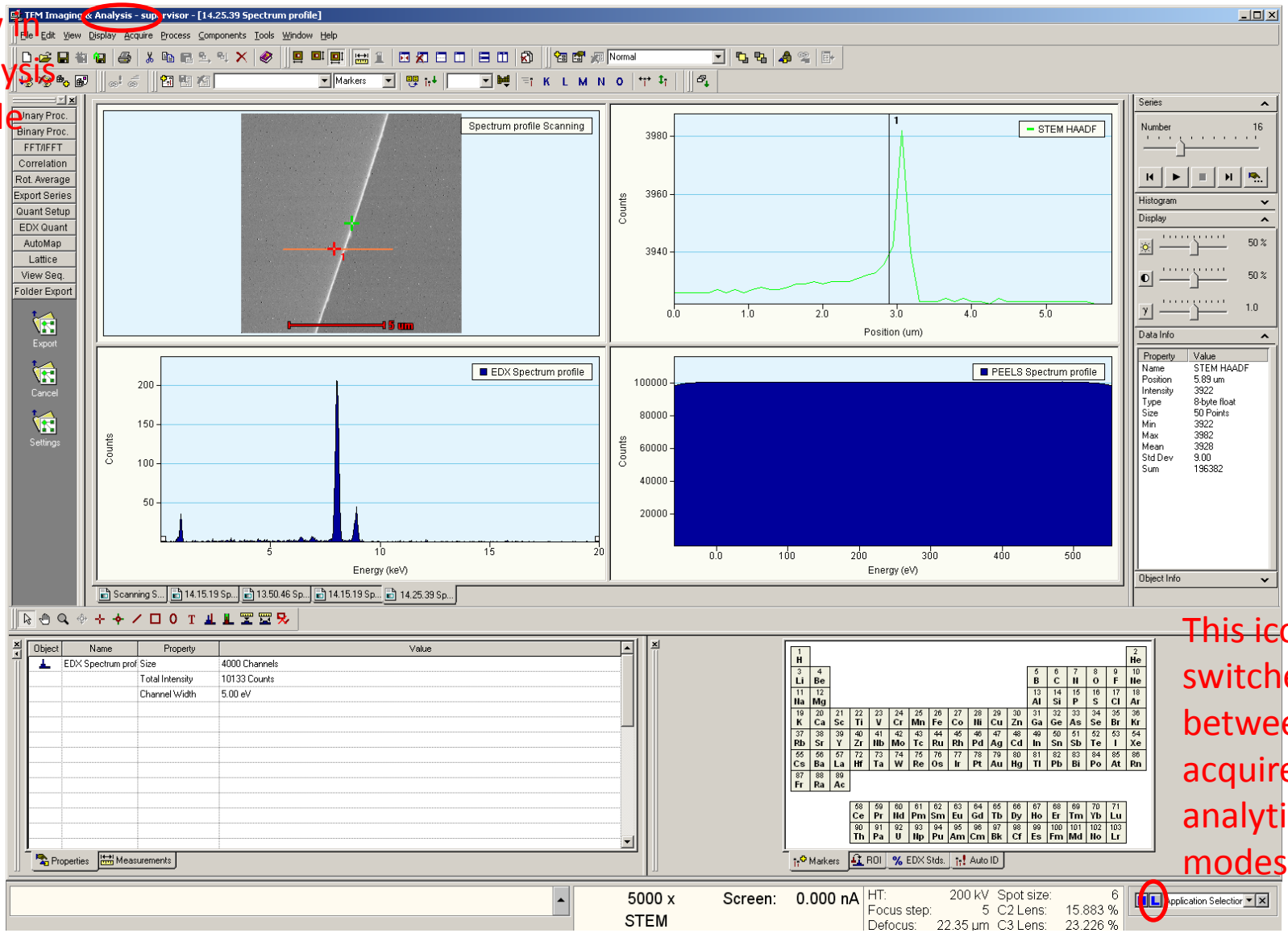


Advanced TIA Techniques: III linking the position marker on the Image to the EDX and EELS Spectra Perhaps the Best Feature in TIA



Advanced TIA Techniques: IV Switching TIA modes

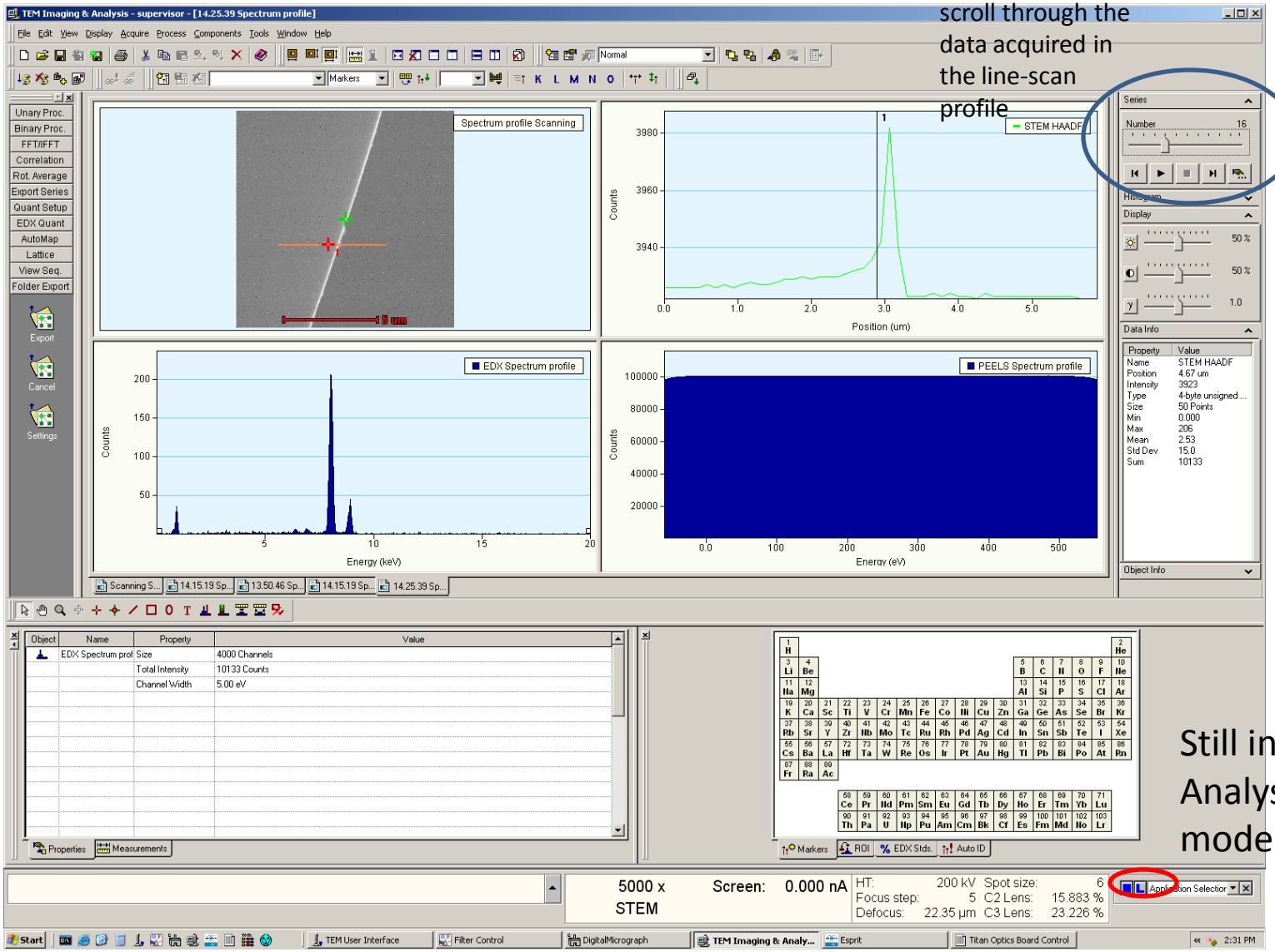
Now in Analysis Mode



This icon switches between acquire and analytical modes

Advanced TIA Techniques: V. Series tool

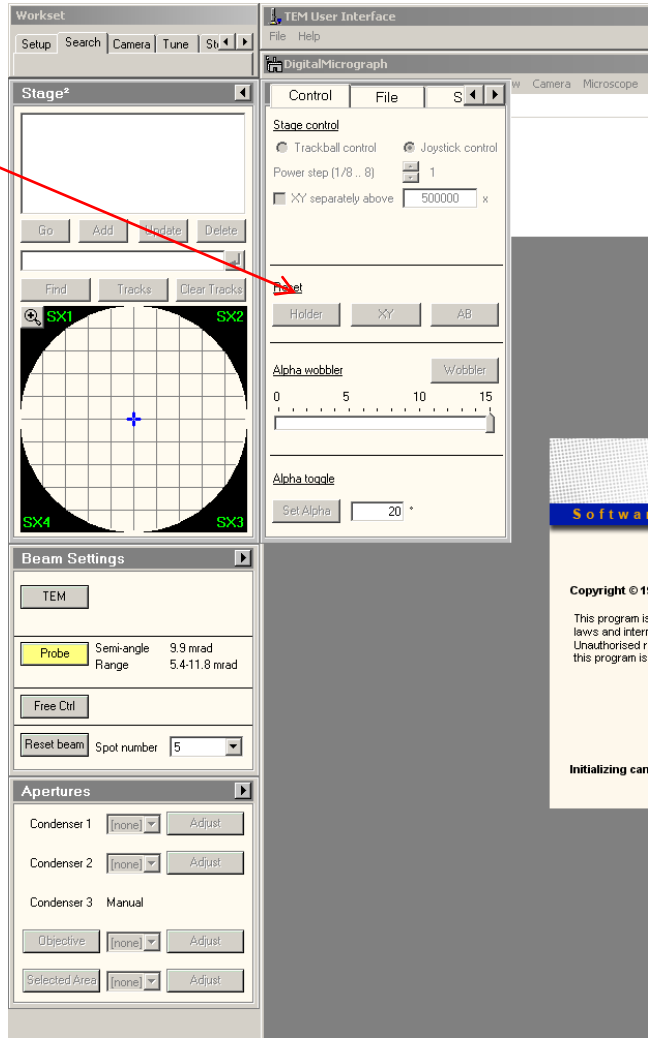
Series tool is yet another way to scroll through the data acquired in the line-scan profile



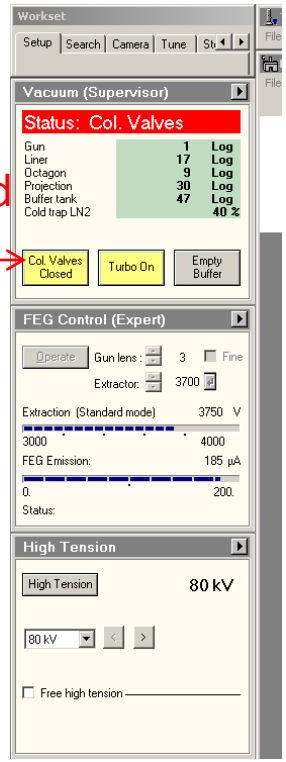
Still in Analysis mode

Resetting holder, so that rod can clear when removed!

1) Click reset holder



2) Click Col Valves till it says Col Valves Closed in yellow



To shutdown

- Save database if using EDS mapping, this saves the hyperspectal data cube for post processing.
- Close EDS shutters
- Click off STEM Insert
- Set back to TEM with registry, make sure TEM beam comes back
- Reset holder, see previous page
- Shutdown column valves, previous page
- Remove specimen rod

The End