



*Canadian Centre canadien
Light de rayonnement
Source synchrotron*

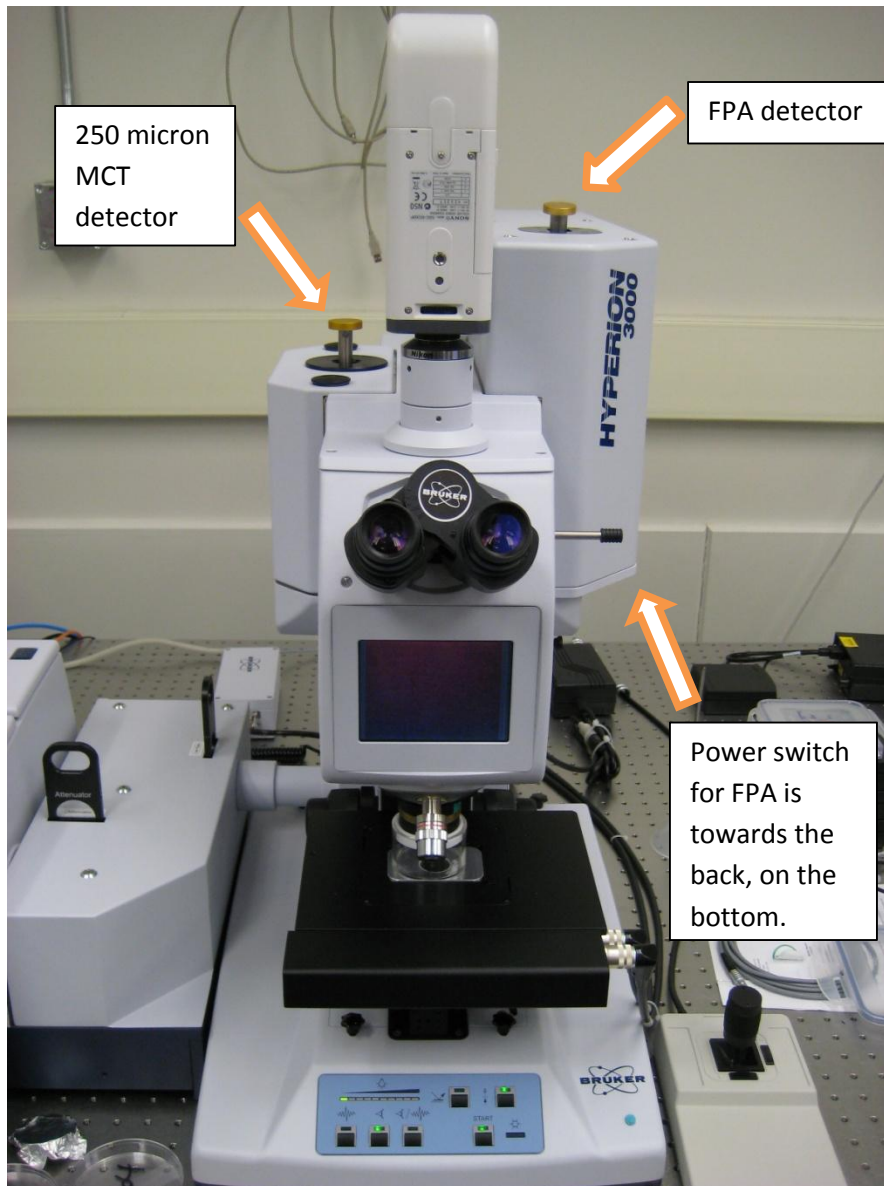
Quick Start Guide

- for the Hyperion 3000 Focal Plane Array Microscope

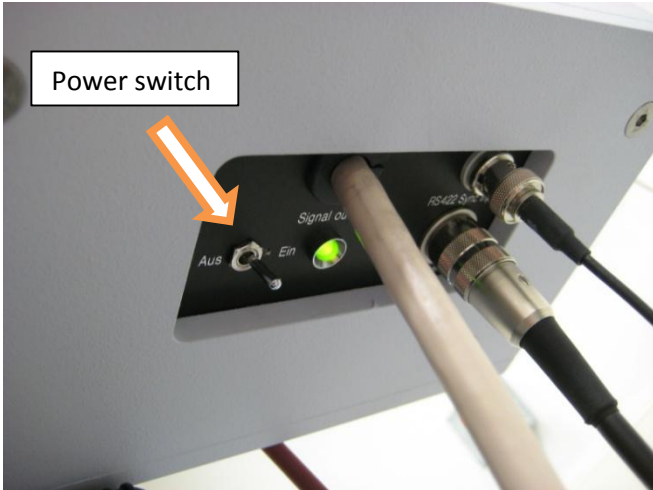
Outline:

- 1. Cool down detectors**
- 2. Save peak position**
- 3. Set-up measurement parameters**
- 4. Take background**
- 5. Take sample measurement**
- 6. Repeat**

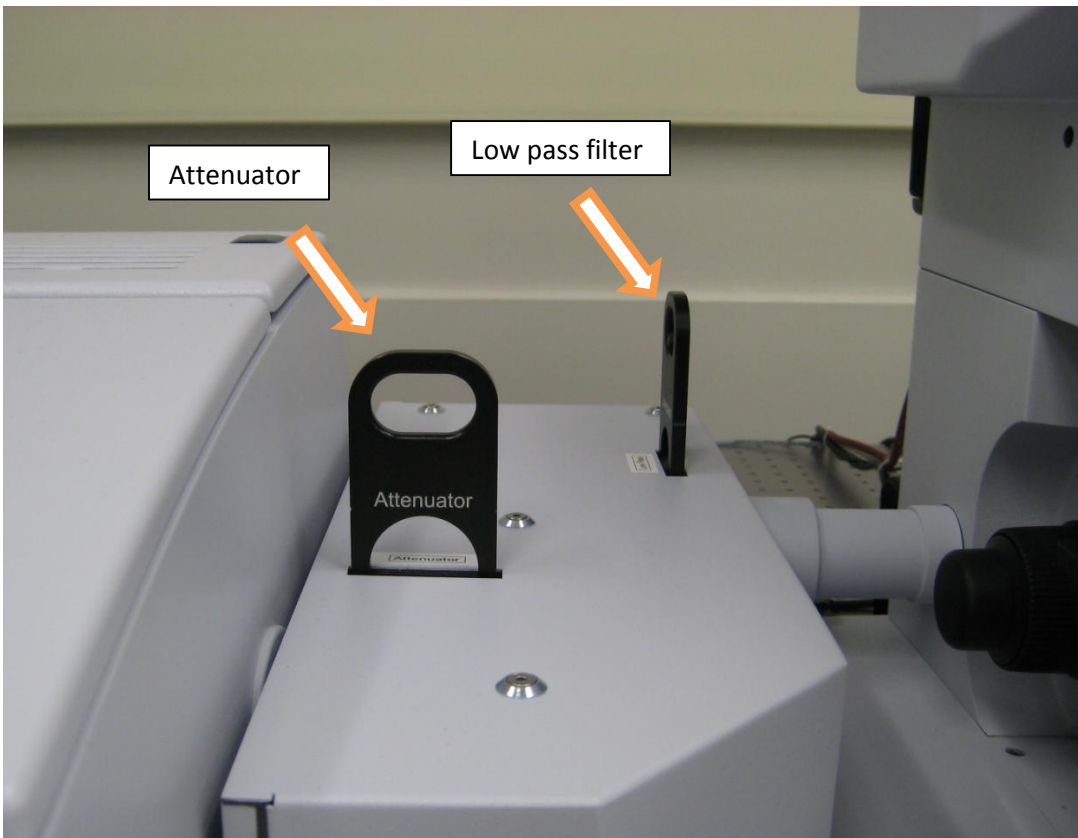
1. Make sure both the FPA (when facing the microscope it is located on the right side) and the 250 micron single-element detector (on the left) have been cooled down with liquid nitrogen.



2. There is a switch underneath the FPA (near the back) that provides power to the FPA, make sure this is on. A green light will light up when it has power.



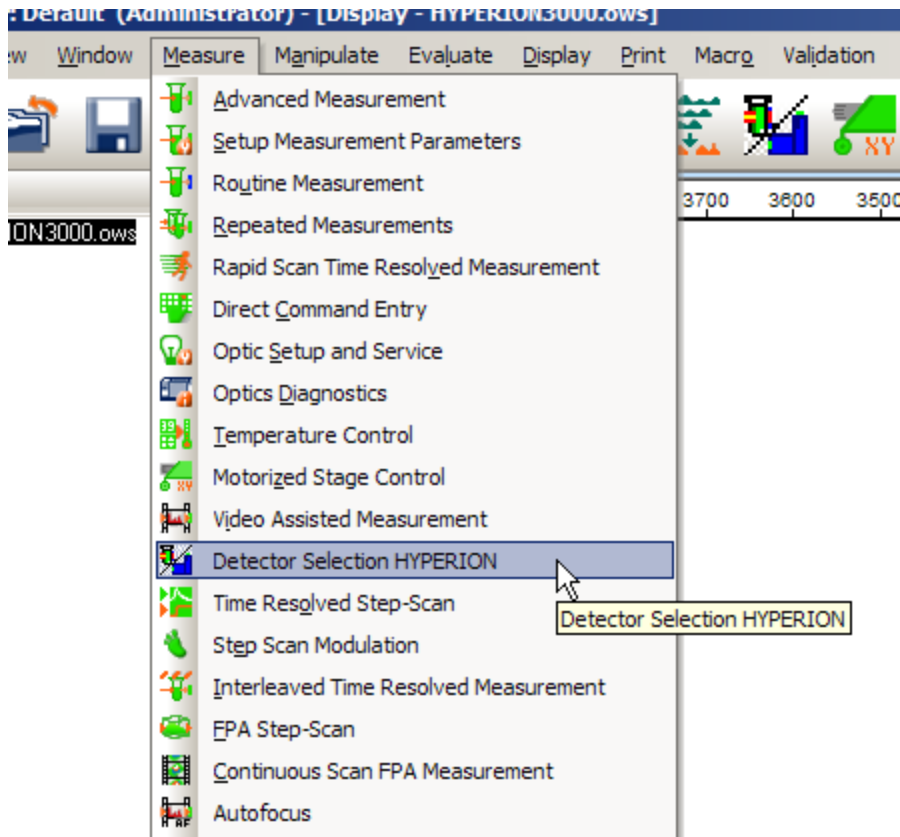
3. Now check to see that the attenuator and low-pass filter are in the beampath as shown in the figure below. When pressed down they are “disabled.”



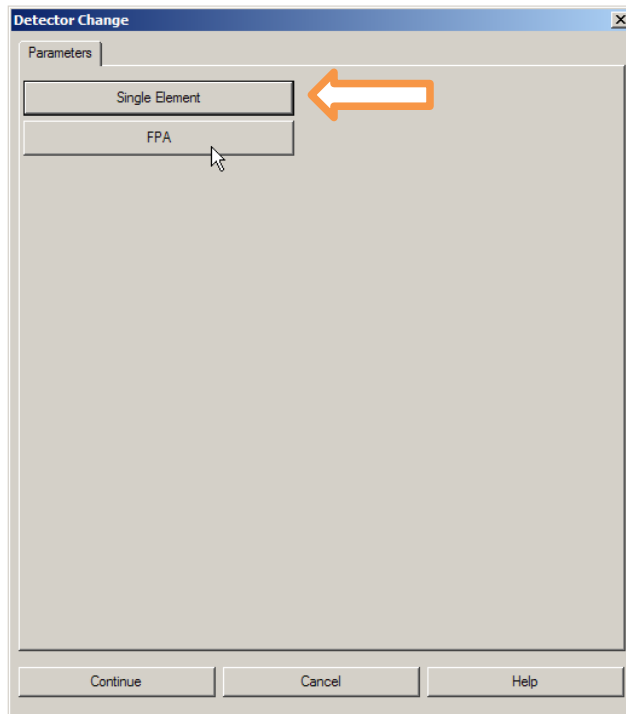
4. Start OPUS. You can leave the “User ID:” to “default” and the password is “OPUS” (all capital letters).



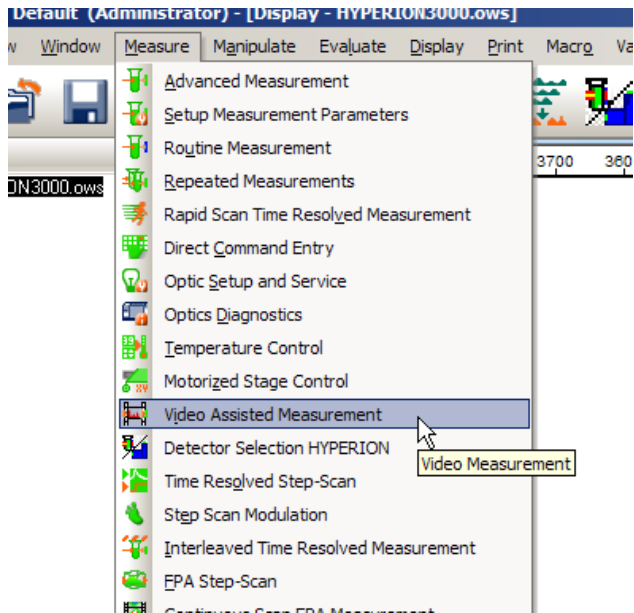
5. Go to the “Measure” menu and select “Detector Selection HYPERION”



6. Select the "Single Element" button.



- The microscope will now move a mirror inside the microscope to send IR beam and light to the single-element detector. We need to use the function “Save Peak Position” with this detector first, to ensure the FPA works properly.
- Once you hear the microscope has finished moving mirrors, select “Video Assisted Measurement” from the “Measure” menu.



- Click on the “Load” button next to “Experiment:”

Video assisted measurement [X]

Basic | Advanced | Optic | Acquisition | FT | Display | Background | XY Stage | Check Signal

Experiment: 1678_FPA_trans.XPM

Operator name: Default

Sample description: BTTB-564B-MAP1

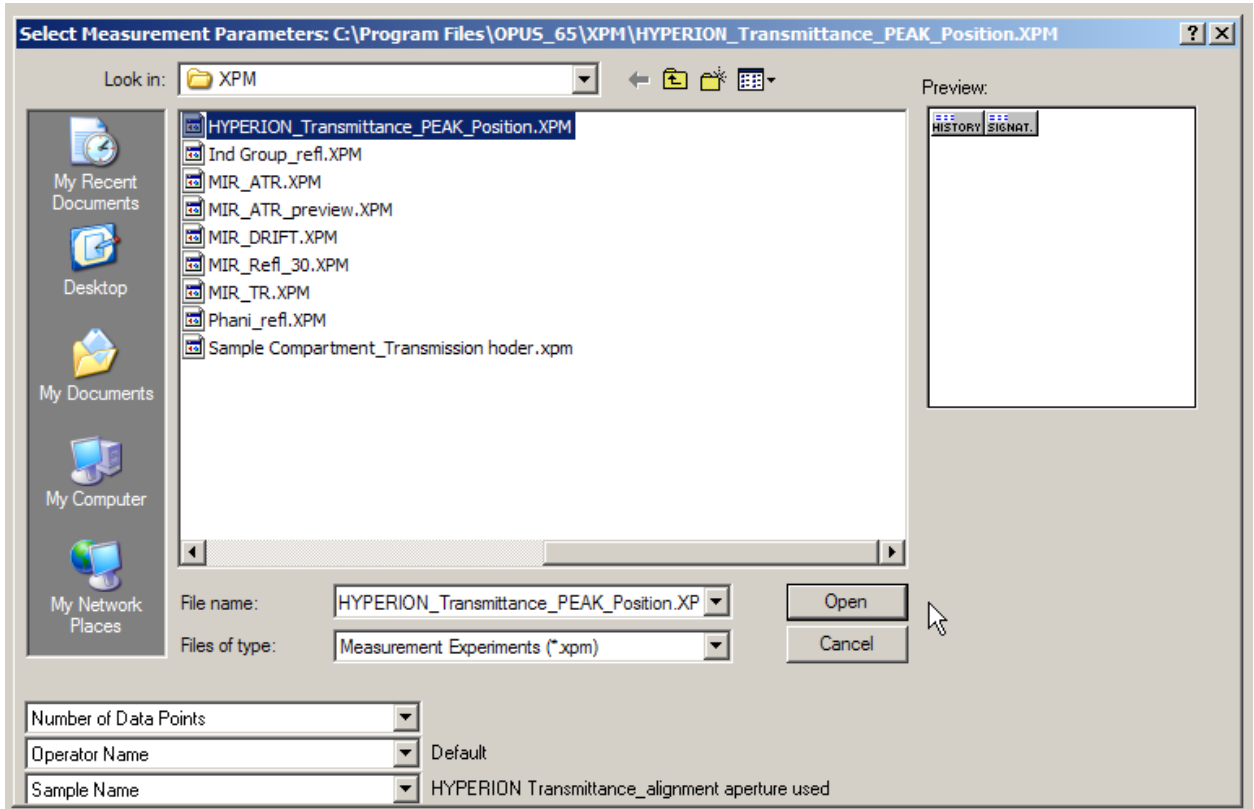
Sample form: 15x transmission ATT LPF Offset=217 Gain=5 Int=0.104750

Path: C:\DATA\28TH JANUARY 2010-TUMOUR BANK\
File name: BTTB-564B-MAP1

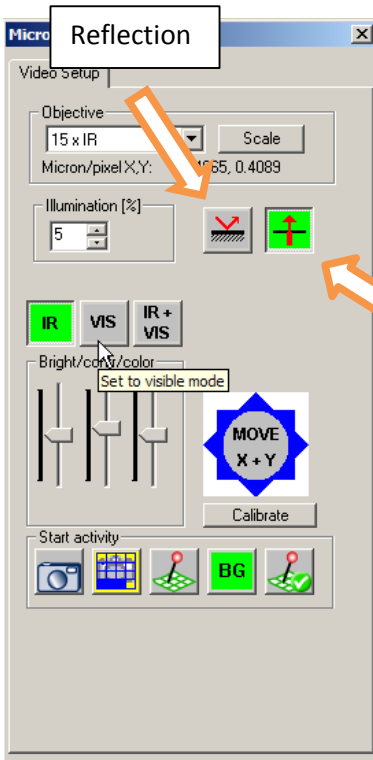
Imaging device: Hyperion_3000

Objective: 15 x IR

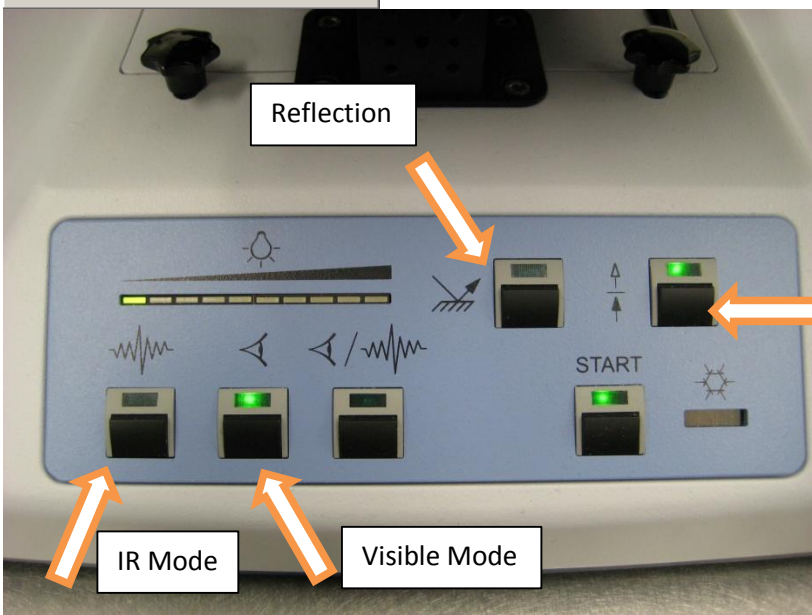
10. Navigate to C:\Program Files\OPUS_65\XPM and load the file named “HYPERION_Transmittance_PEAK_Position.XPM”. (Select the file, and then click “Open”).



11. Now click “Start Measurement without 3D” on the “Basic” tab.
12. Change the microscope to visible mode (VIS) if currently in IR mode. You can use the buttons on the front of the microscope or click the “VIS” button on the screen. Wait ~10 seconds for it to change modes. Also make sure the microscope is in transmission mode.



Transmission



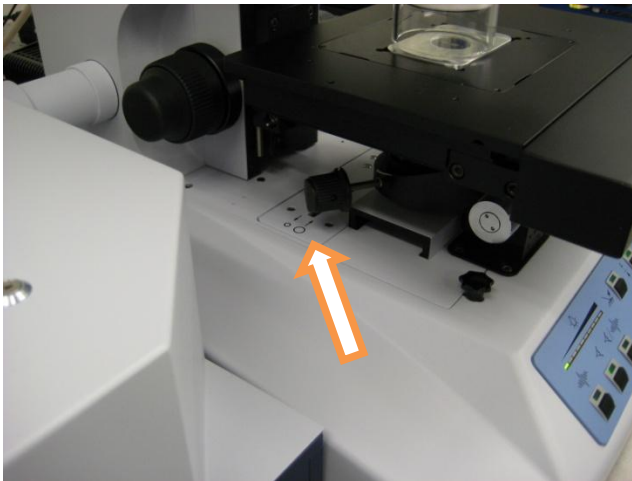
Reflection

Transmission

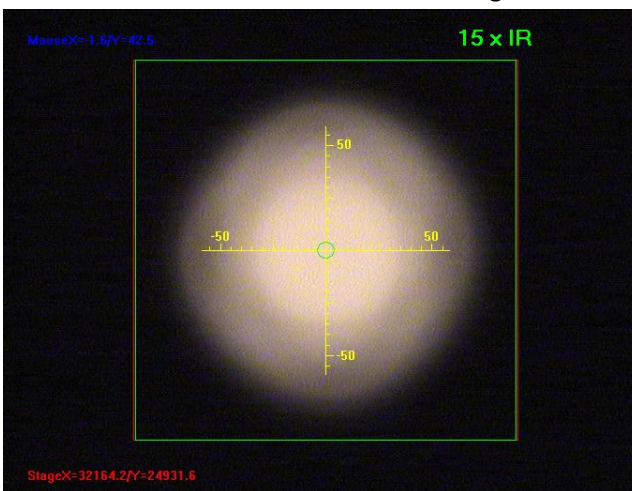
IR Mode

Visible Mode

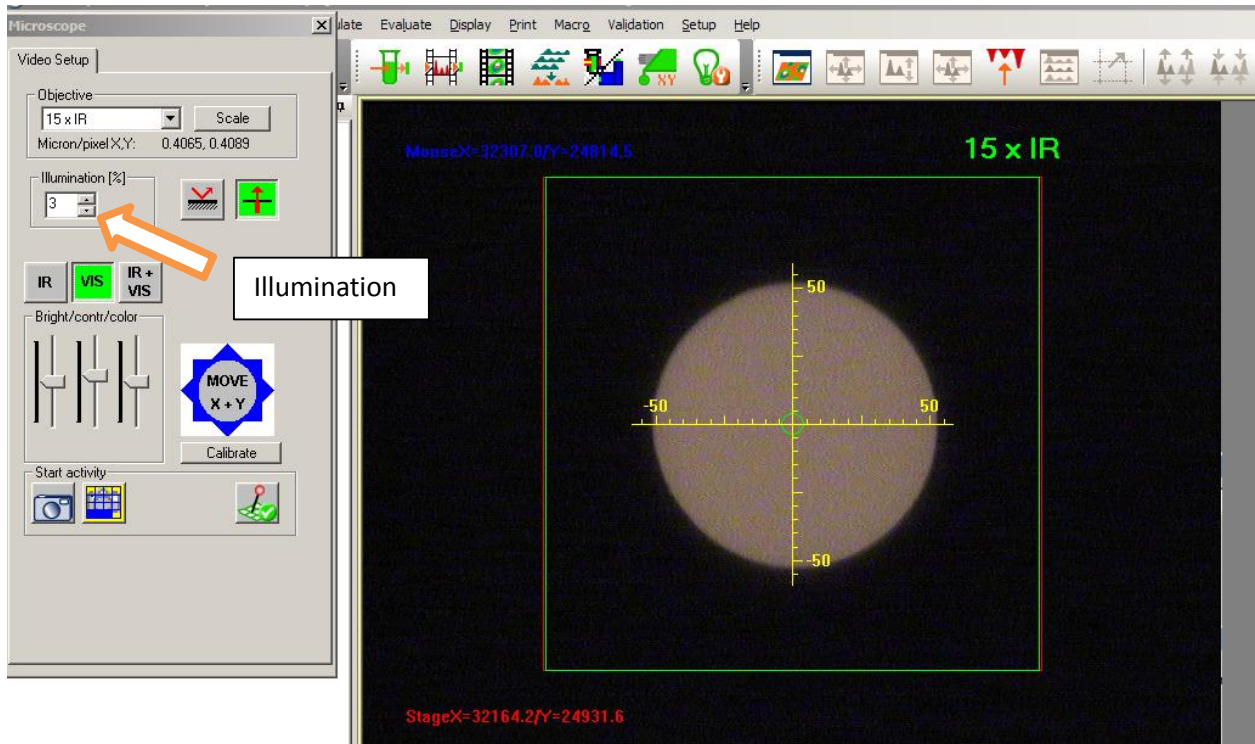
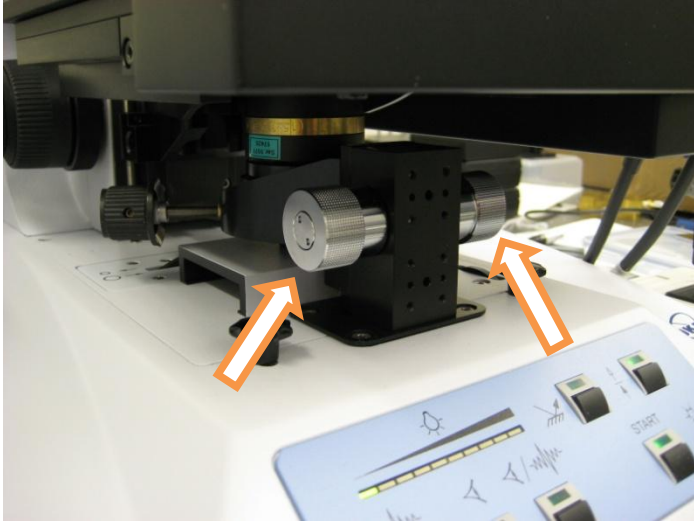
13. Move the Transmission alignment aperture (small circle in the picture) into position by rotating the dial counter clockwise towards the left side of the microscope.



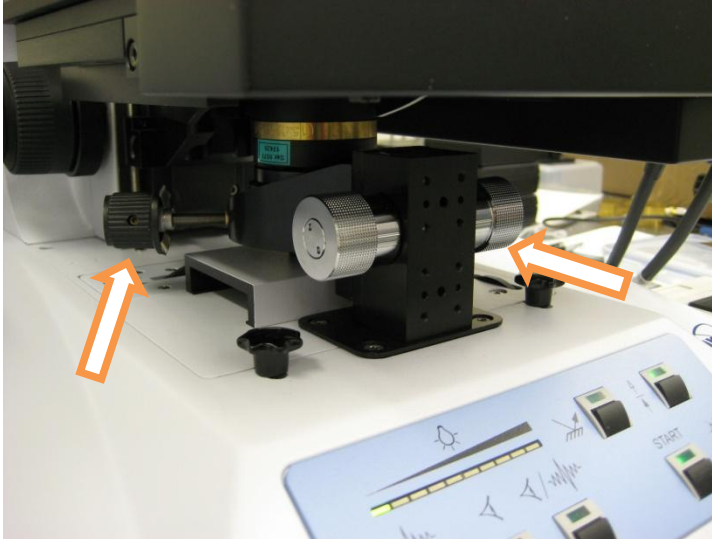
14. The screen should now show a circle of light in the video window.



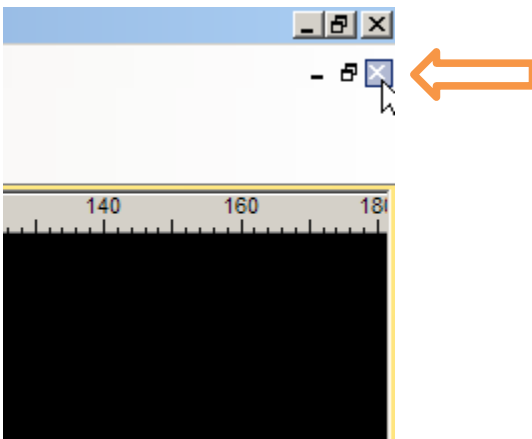
15. Now adjust the focus of the condenser using either/both of the silver knobs, to get the circle edges nice and sharp – as seen in the picture below. It helps to turn down the illumination to 3-5%.



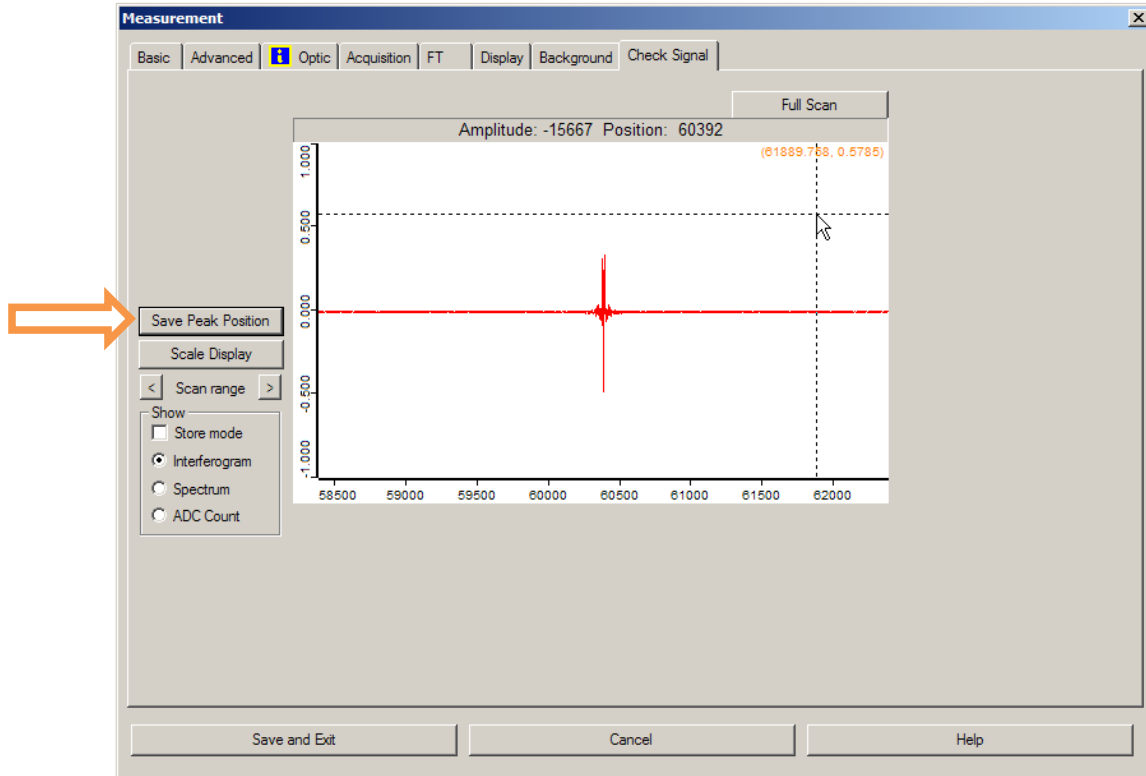
16. Use the two black knobs to center the circle on the yellow crosshairs.



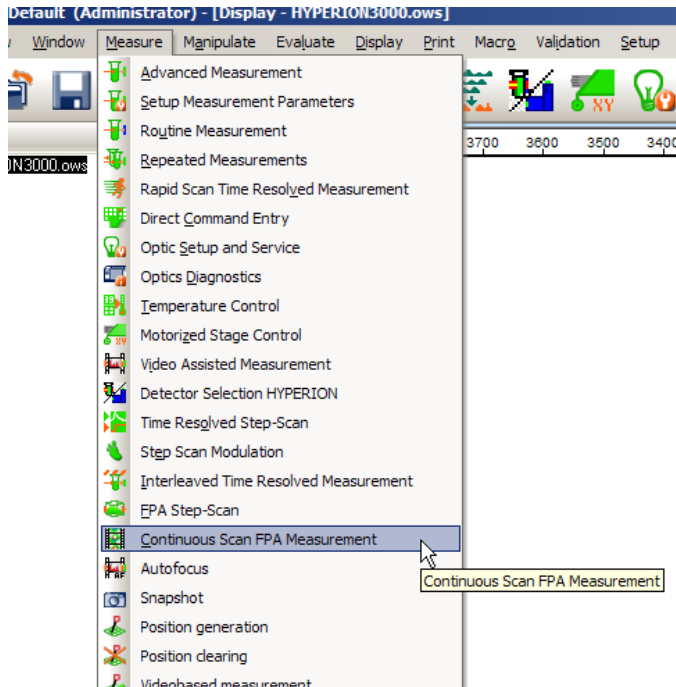
17. Switch to IR mode. The video window should now be black.
18. Close the Video Assisted Measurement window, by clicking on the **small "x"** below the larger "X" that closes OPUS.



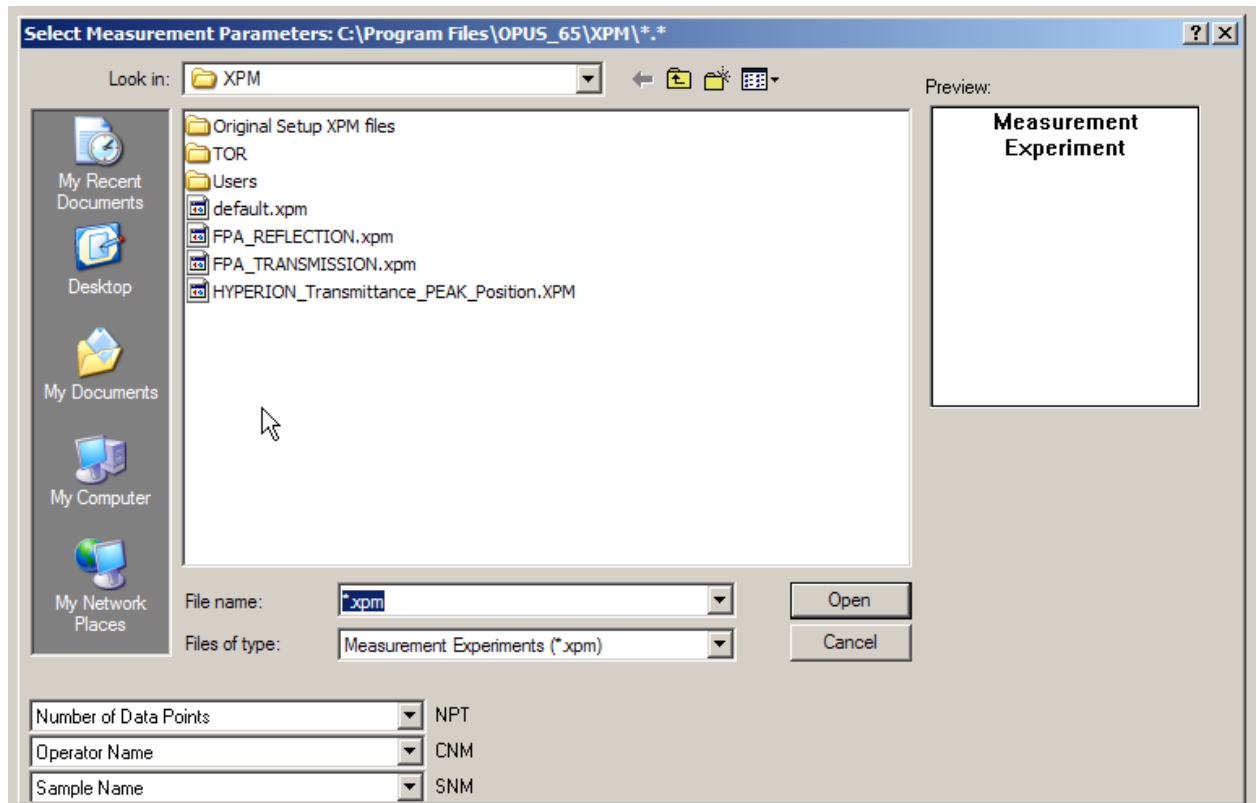
19. Select "Video Assisted Measurement" from the "Measure" menu again.
20. Now click on the "Check Signal" tab on the open "Video assisted measurement" window.
21. Ensure 30 minutes have passed since cooling the 250 micron MCT detector.





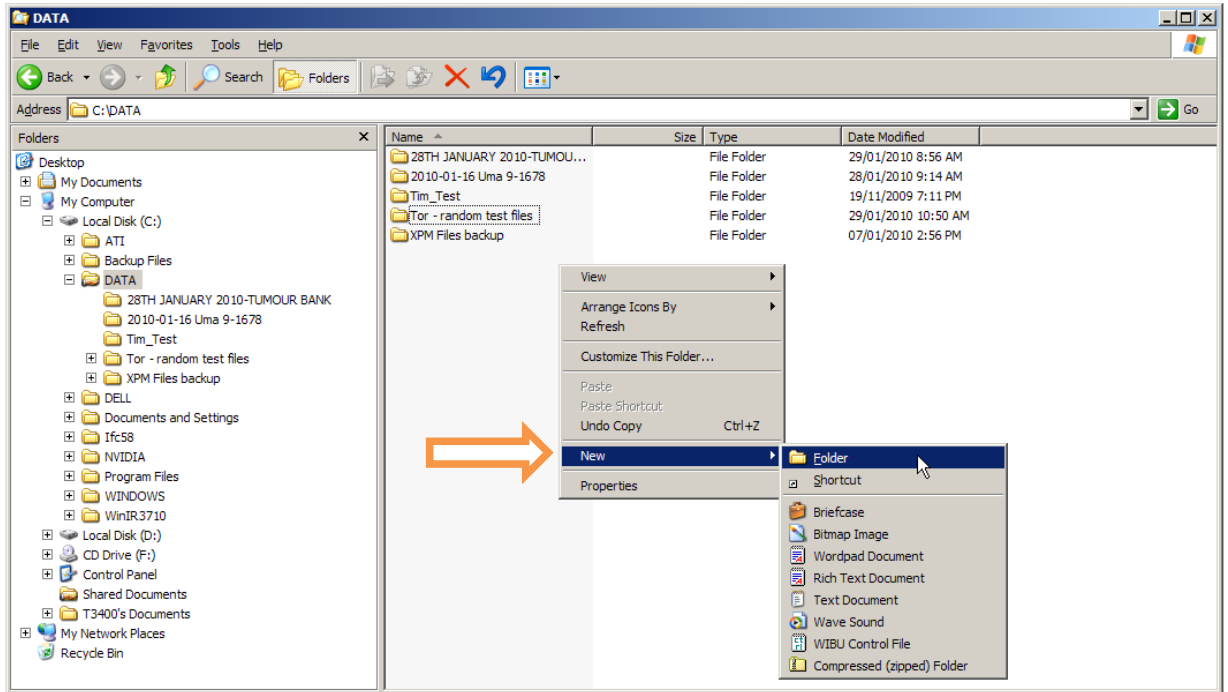
22. Now click on the “Save Peak Position” button.
23. Click “Save and Exit”
24. Move the alignment aperture out of the way (see Step 13).
25. Go to the “Measure” menu and select “Detector Selection HYPERION”. This time click the “FPA” button, wait 10 seconds, and click “Continue”.
26. Under the “Measure” menu click on “Continuous Scan FPA Measurement”



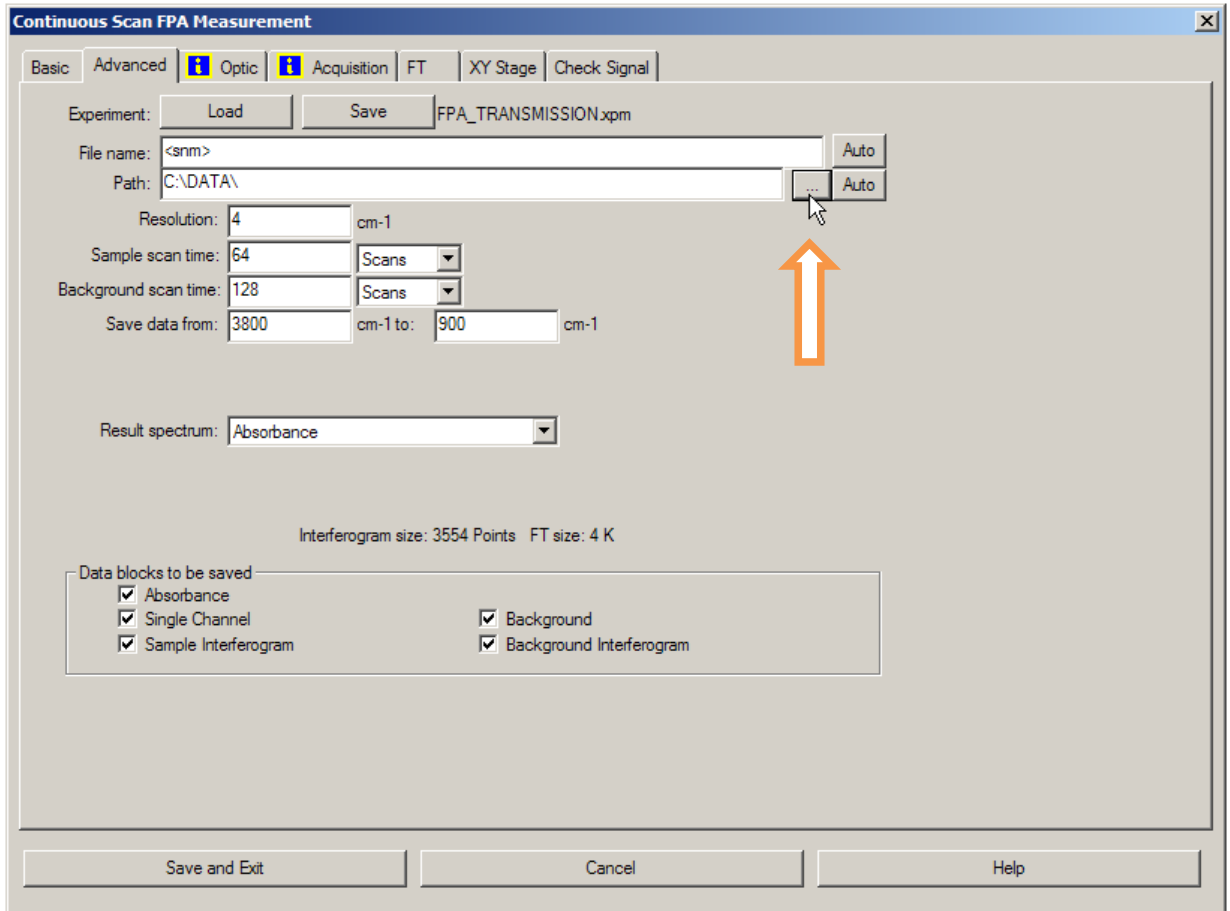
27. Load the XPM file named “FPA_TRANSMISSION.xpm” or “FPA_REFLECTION.xpm” depending on whether you are doing transmission or reflection measurements.



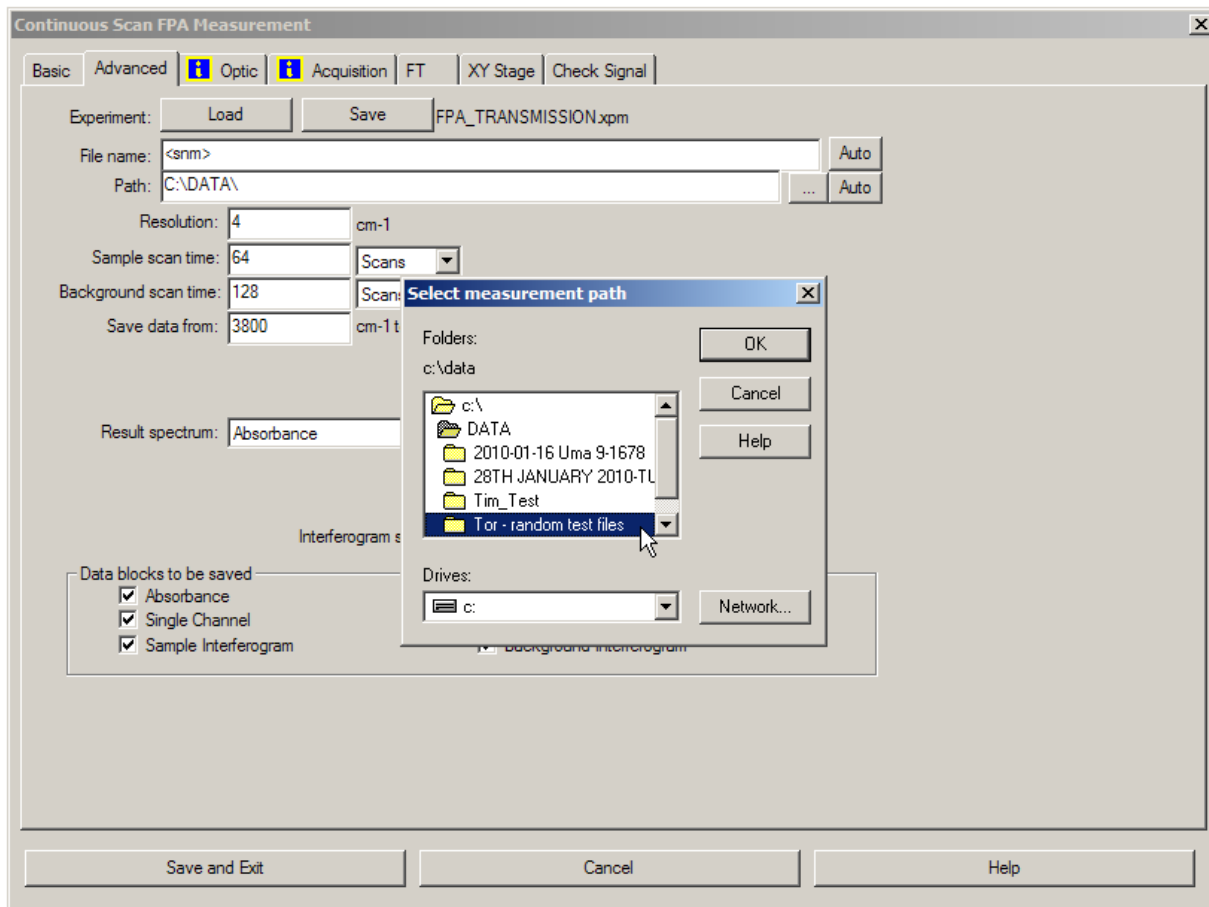
28. Open up Windows Explorer –  +  (Windows key + E).
29. Navigate to C:\DATA – create a folder by right-clicking on an empty space, select New → Folder.



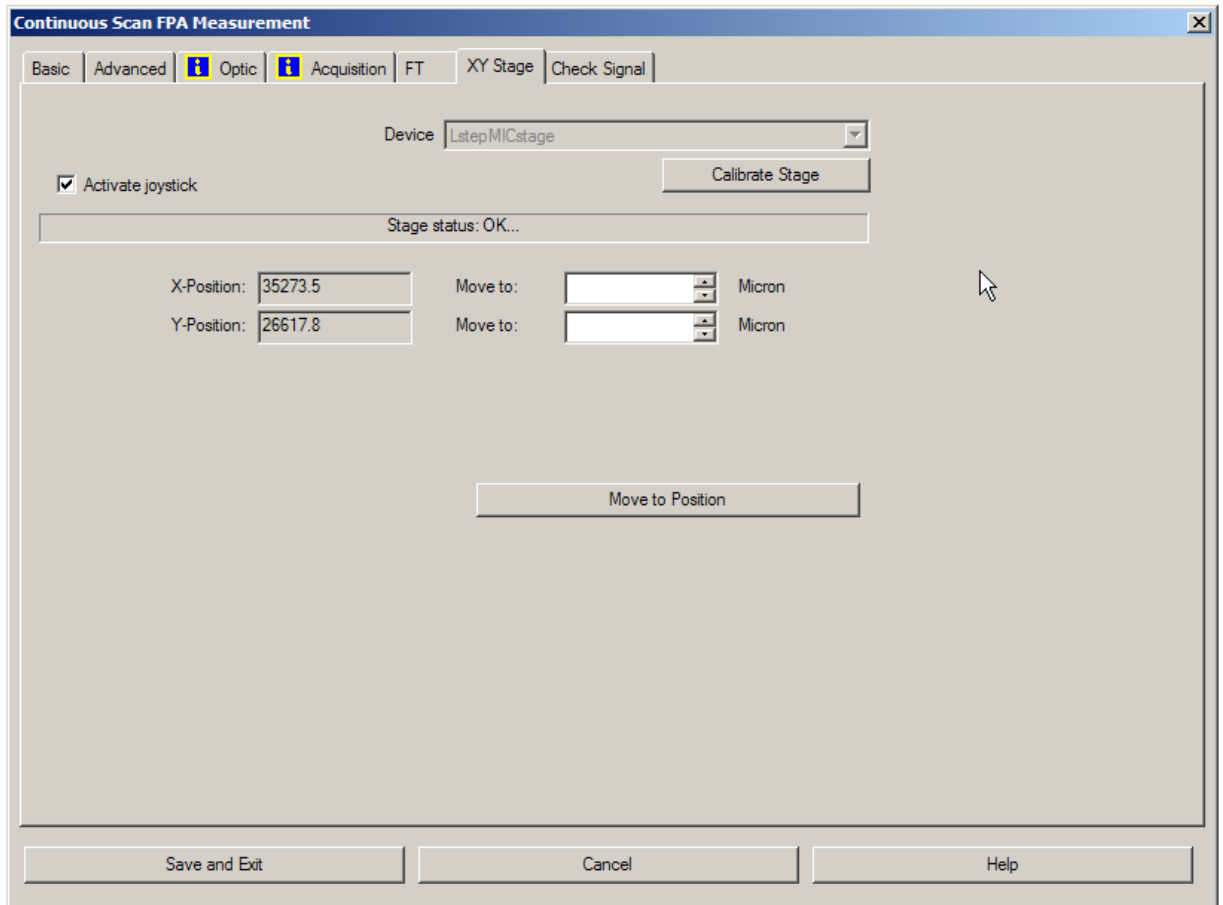
30. Type in a folder name that you want to use to store your data. Hit Enter.
31. Go back to OPUS.
32. Click on the "Advanced" tab, and then click on button with three dots in it beside the "Path:" field.



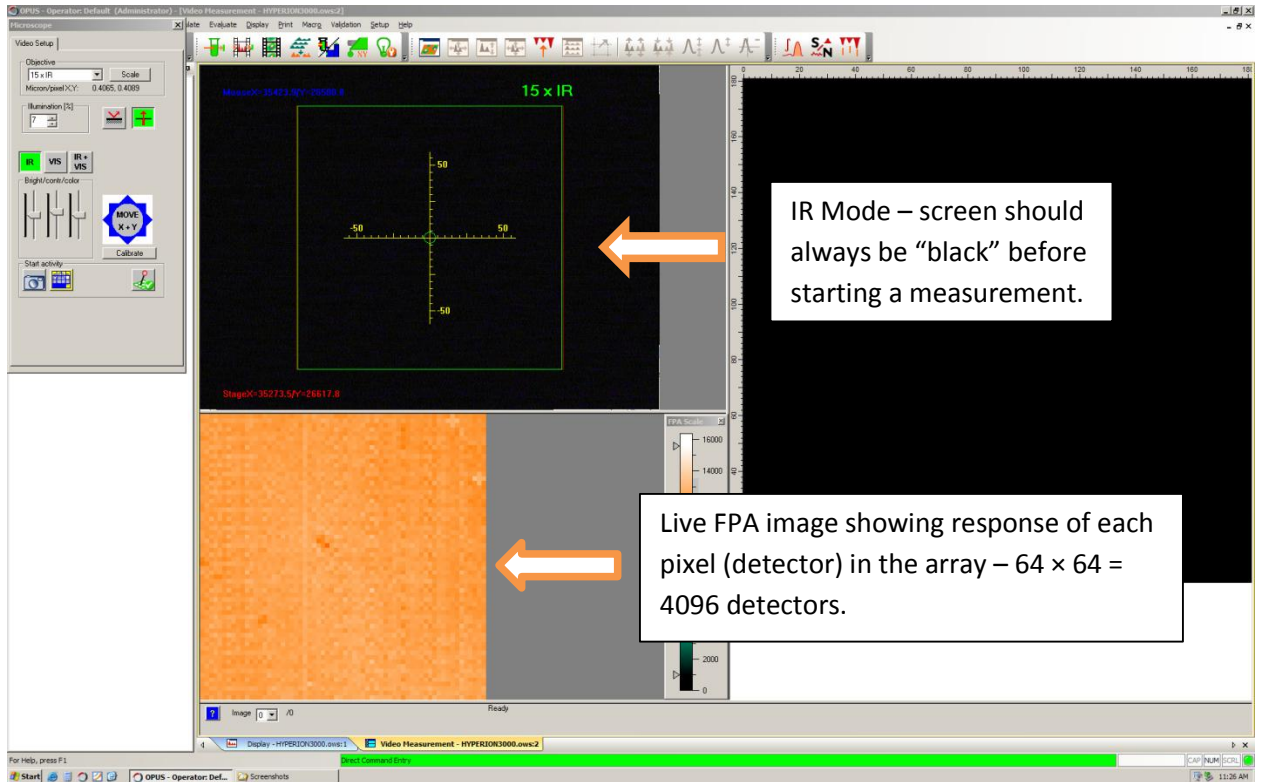
33. Navigate to the folder you just created and named in Windows Explorer.



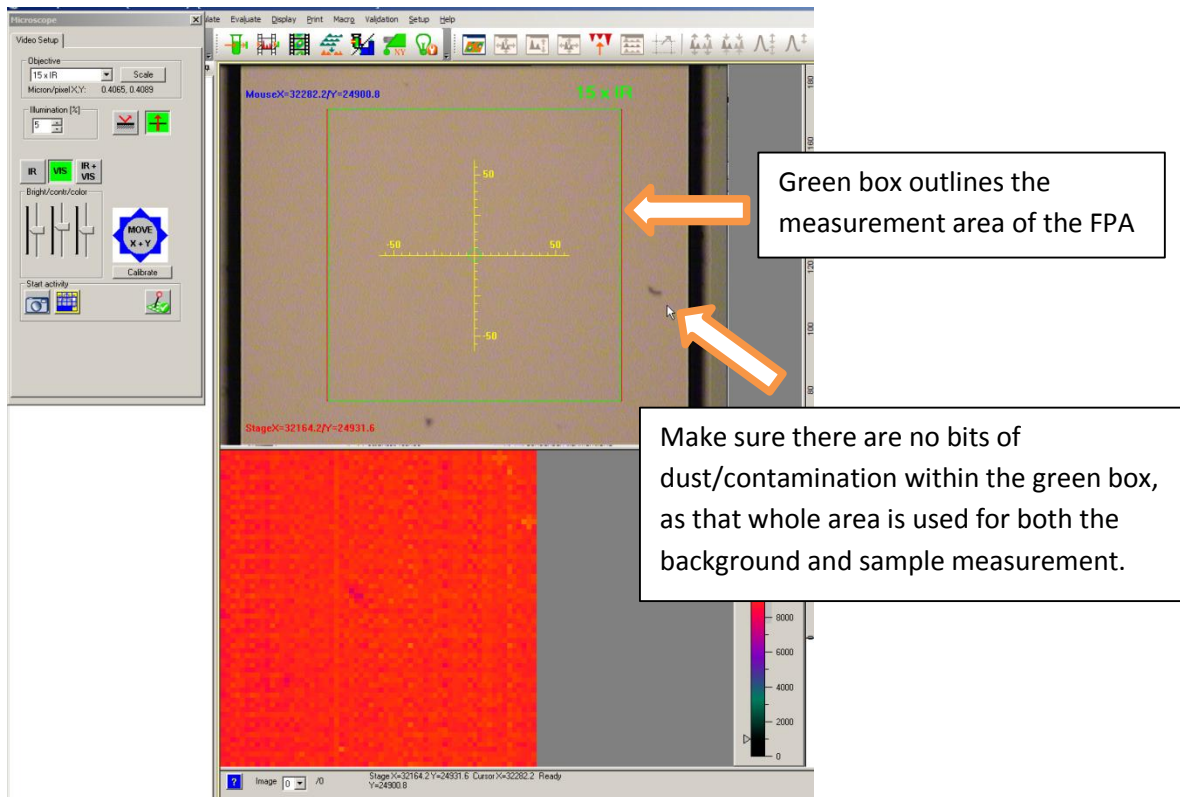
34. Click "OK"
35. Change any other settings needed under the Optic, Acquisition, and FT tabs. To minimize the file size the phase resolution can be set to eight times the resolution used.
36. The file name can be changed on the Basic tab under the heading "Sample Description", and if you use the code "<snm>" on the "File name" line in Advanced settings, the file name will always take what you write down for "Sample Description" under the Basic tab.
37. Go back to the "Advanced" tab, click "Save" beside the text "Experiment:"
38. Re-name the .XPM file to something personal and save it to the following path: C:\Program Files\OPUS_65\XPM\Users
39. Anytime you change any settings in the "Continuous Scan FPA Measurement" window you will need to re-save the .XPM file, to keep those changes.
40. Click on the "XY Stage" tab.
41. Make sure that the X- and Y-Position values are reasonable. The stage has a range of 75000x50000 microns, so if the stage is somewhat centered, you should be around half those values (i.e. X = 37500, Y=25000). If the stage is centered and the values are X=0, Y=0, then the stage needs to be calibrated. Click the "Calibrate Stage" button in that case, and the stage will move to its zero position. Ensure that the purge cover will not get dragged across your sample when the stage moves to that position.



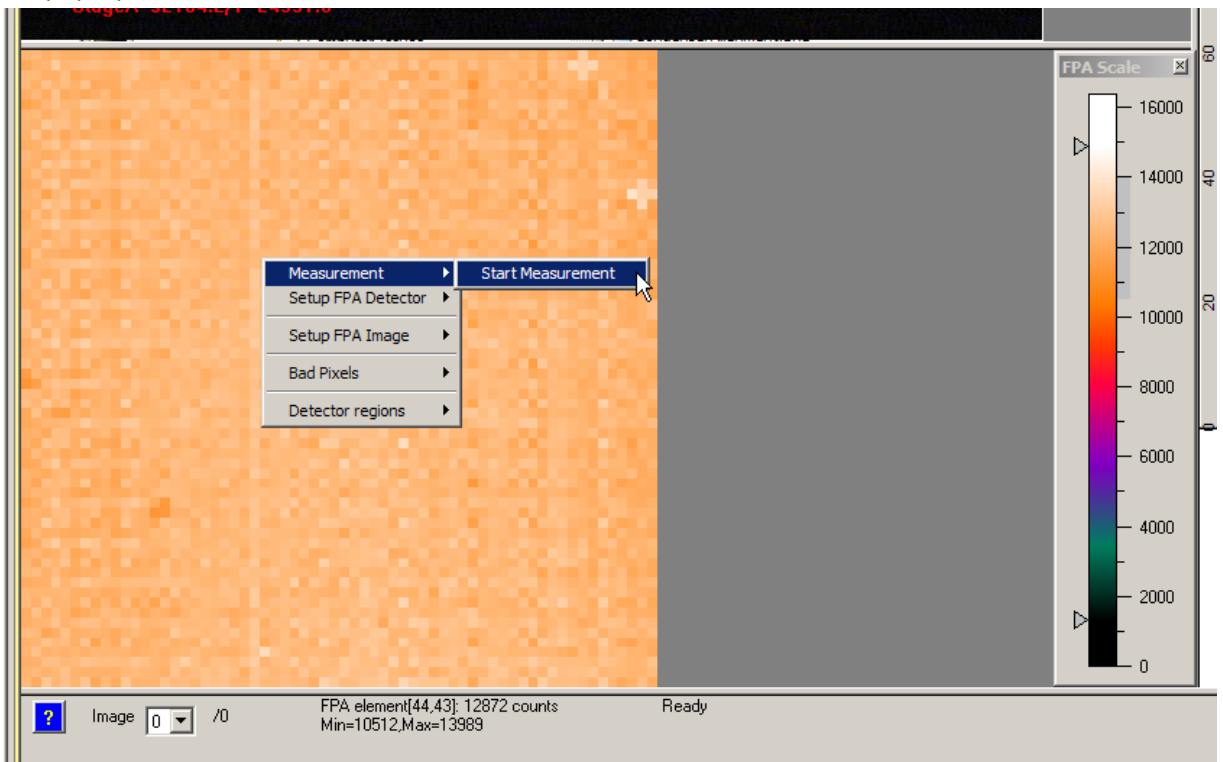
42. Move the stage back into the desired position using the joystick.
43. Now select the "Basic" tab again.
44. Click on "Start Video Assisted Continuous Scan FPA Measurement"
45. You'll be presented with a screen that looks like this:



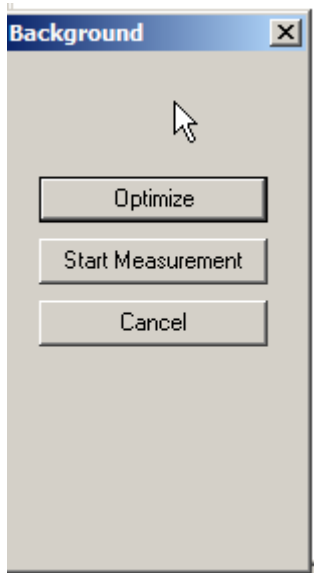
46. The above picture was taken with the microscope in IR mode.
47. Switch to visible mode and find a clean/blank area to take a background measurement in. Make sure that both the condenser is focussed and the alignment aperture is out of the way.



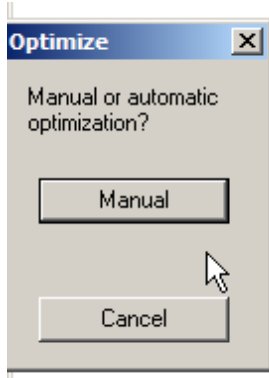
48. Switch back to IR mode.
49. **Right click** on the live FPA image.
50. In the pop-up menu, click on “Measurement → Start Measurement”



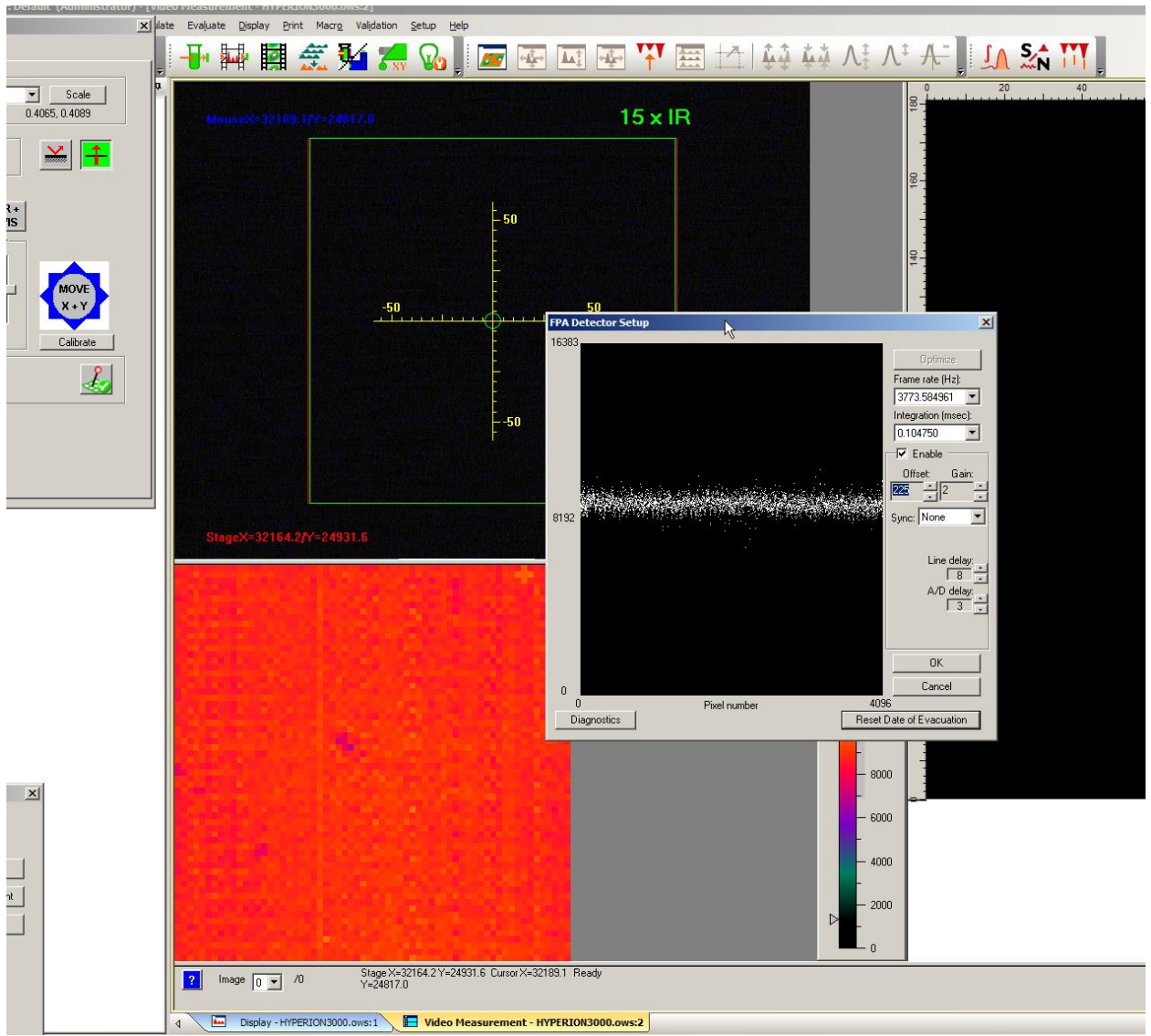
51. Another window will pop-up.



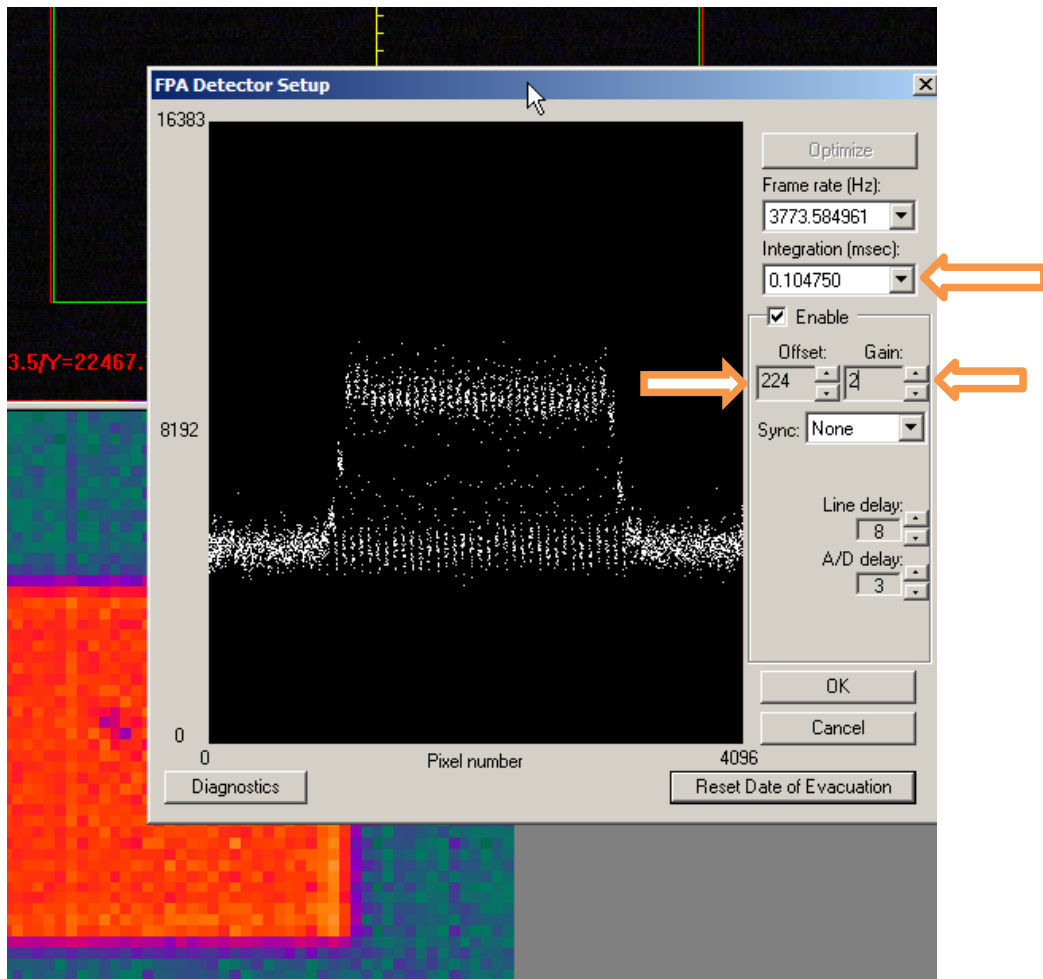
52. Click “Optimize” – bringing up another window.



53. Click "Manual" (as there is no "Automatic" option).
54. You will now be presented with the live "oscilloscope" screen for the FPA. The values that can be changed here will not be stored anywhere in your data file(s), so it is best to make note of them in your log book for future reference. Each white dot represents the signal from one of the 4096 detector elements in the FPA. Each detector has a slightly different sensitivity; therefore you see the spread shown in the screen. The idea here is to have the response maximized for the detectors without saturating the analog-to-digital converter.



55. The values that can be changed are "Integration (msec)", "Offset", and "Gain".



56. The frame rate should always stay at 3773 Hz. It is helpful to close the upper apertures partly to be able to see the maximum and minimum response of the FPA simultaneously. This is shown in the above figure with the two sides at a lower level than the middle. In the background you can see the bright orange square which corresponds to the FPA pixels which haven't been blocked by the upper apertures. You can now adjust the integration time, offset, and gain, so that the maximum and minimum intensity falls within the following optimal ranges:

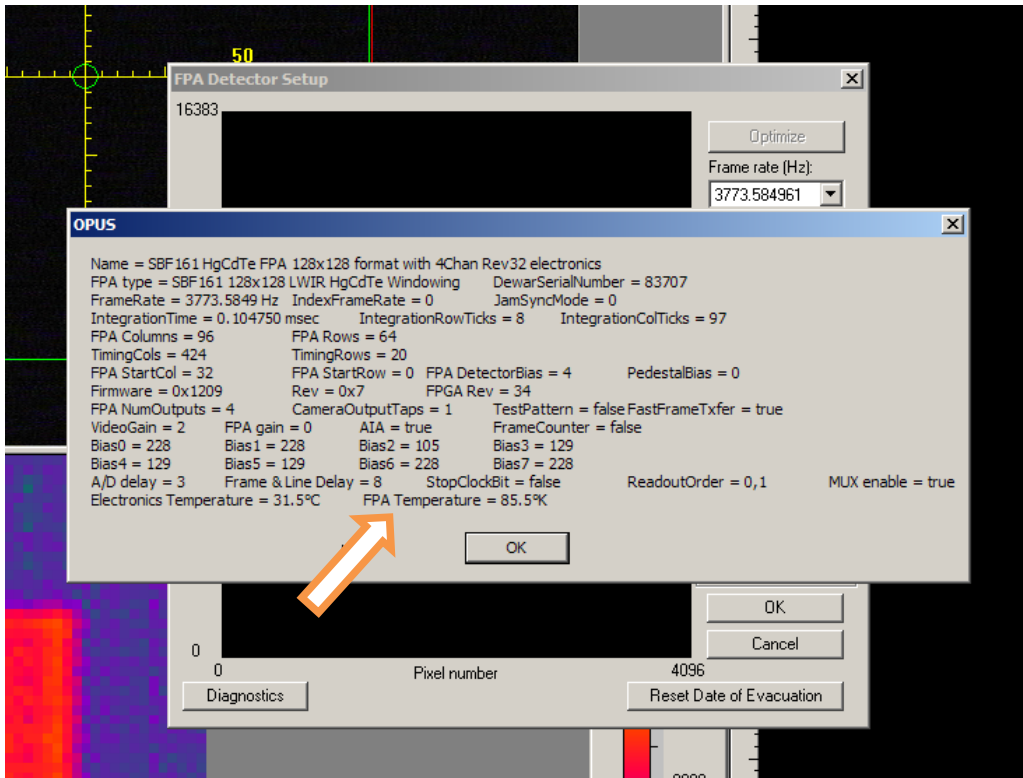
Minimum at 15-20%

Maximum at 50-60%

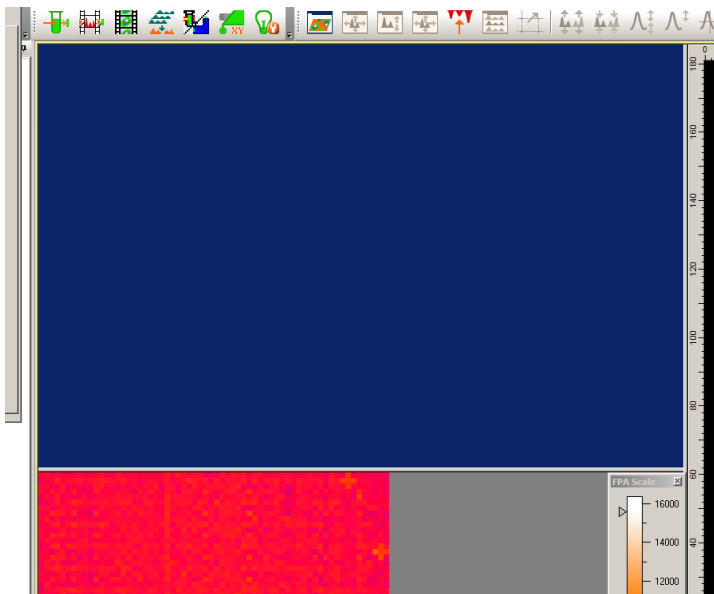
Usually the integration time stays at 0.104750 msec, and the gain between 2-4.

If it is difficult to get the intensity strong enough, the attenuator can be disabled by pushing it down into the optics transfer box (see step 3).

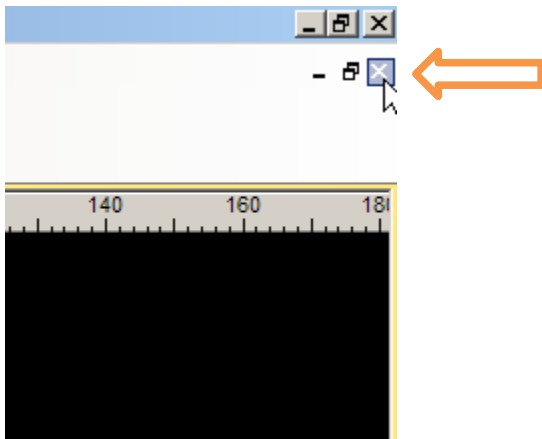
57. You can also check the temperature of the FPA from this screen by clicking on the "Diagnostics" button. The temperature should be below 87 K for proper operation. The hold time for the FPA is around 8-10 hours, so if the temperature is above 87 K, it is time to add more liquid nitrogen to the detector.



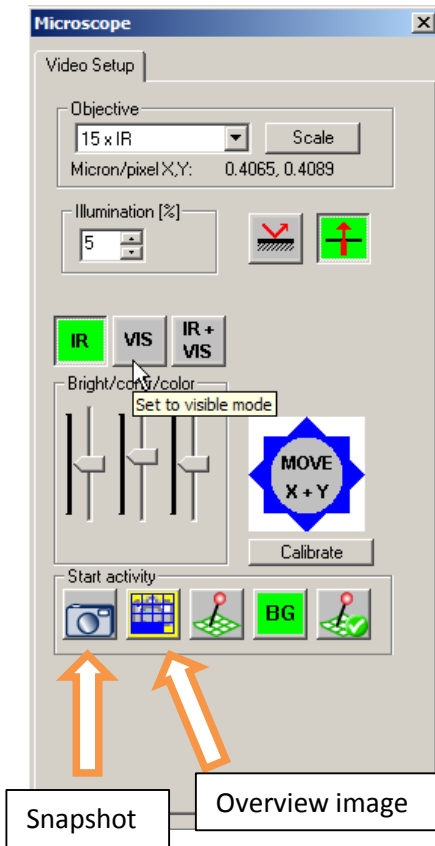
58. Click "OK" when done optimizing the FPA for the background measurement.
59. Now click on the "Start Measurement" button. Avoid doing anything with the computer once the measurement starts (even moving the mouse cursor can affect data acquisition).
60. After the measurement has started the video area of the screen will turn blue for the duration of the measurement. Once the scans have finished you will hear a computer beep, and a bit of additional data processing will take place before the computer is ready for the sample measurement. Once the microscope is ready the blue area will turn back to black.



61. Once the measurement is done close the “Video Measurement” window by clicking on the **small** “x” below the larger “X” that closes OPUS. This needs to be done after every measurement is taken, whether taking a background or measuring the sample.

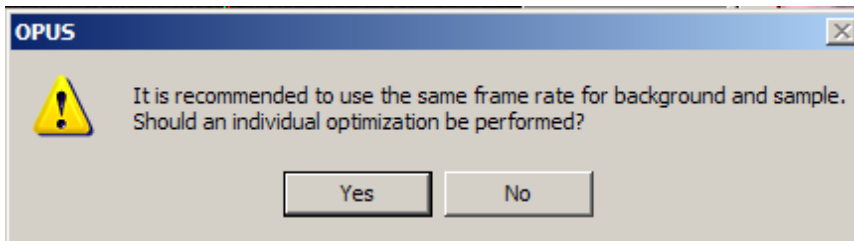


62. Bring up the “Continuous Scan FPA Measurement” window again.
63. Switch to visible mode (VIS).
64. Find the area of interest on your sample that you want to measure.
65. Take a “Snapshot” or “Overview Image” of the visible image by clicking on the respective button.

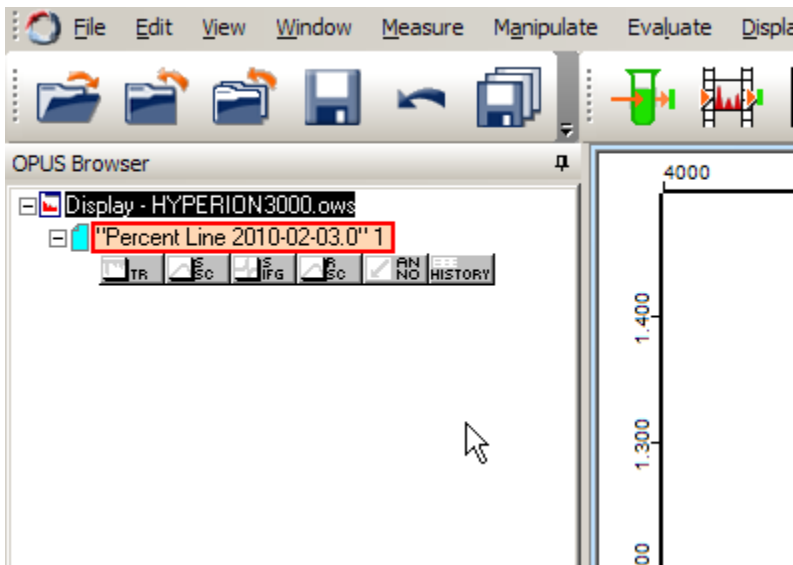


66. Switch back to IR mode.

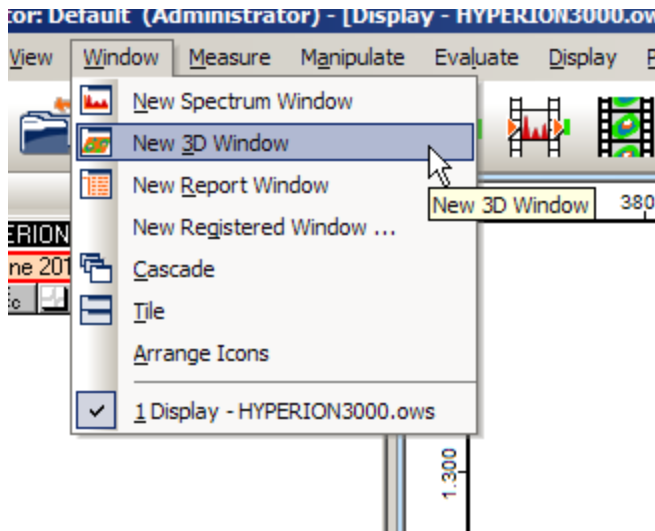
67. Right click on the live FPA image.
68. In the pop-up menu, click on "Measurement → Start Measurement"
69. Click "Optimize" – it will give you the following warning message:



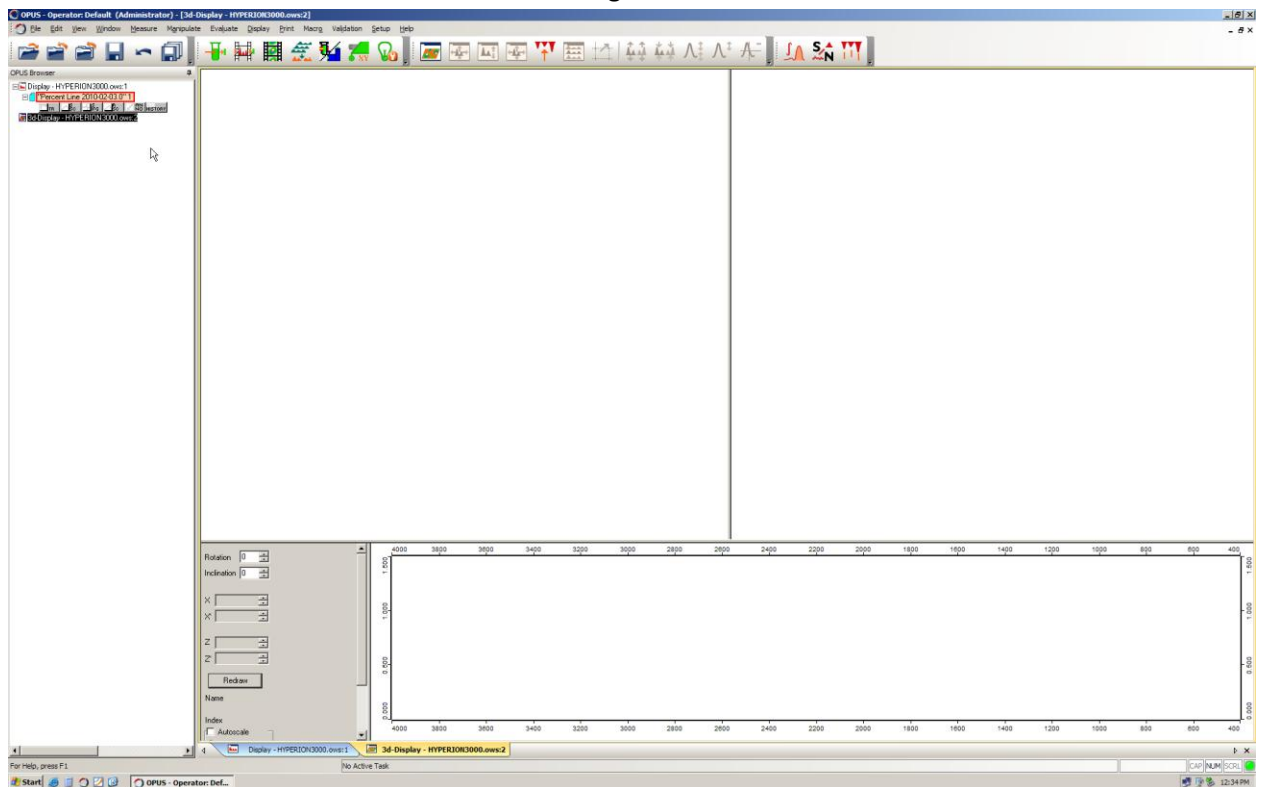
70. Click "Yes"
71. Click "Manual" (as there is no "Automatic" option).
72. Re-adjust the FPA settings if needed. If the signal intensity still looks reasonable, it is best to leave the settings the same between the background measurement and sample measurement.
73. Click "OK" and then "Start Measurement"
74. Wait for the screen to change back to black. For the sample measurement the screen will also show a red check-mark when it is done the measurement.
75. Close the "Video Measurement" window.
76. The screen will now have a file present in the "Display" window under the "OPUS Browser" area.



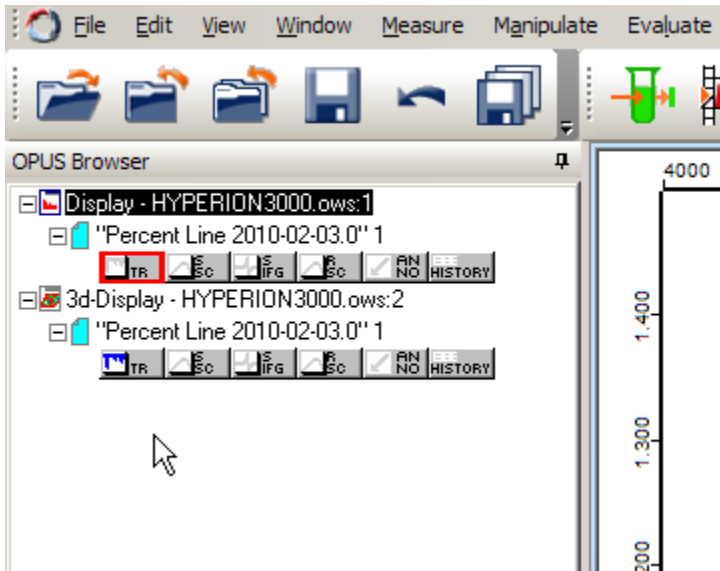
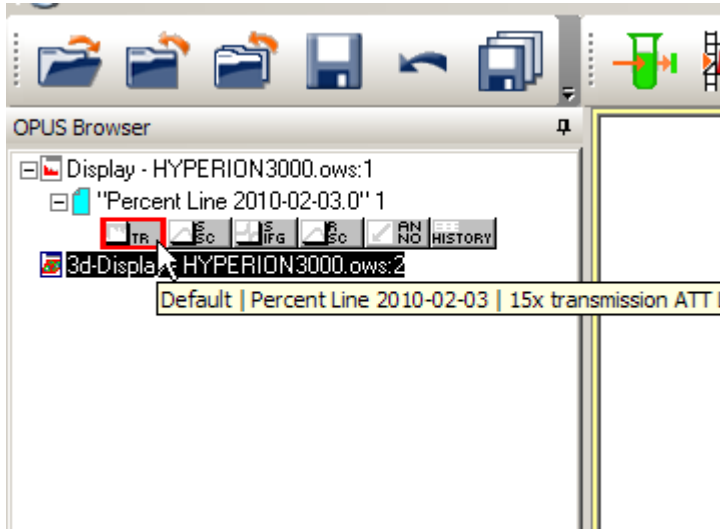
77. We need to open a 3D window that can display the result of the measurement. Go to "Window → New 3D Window"



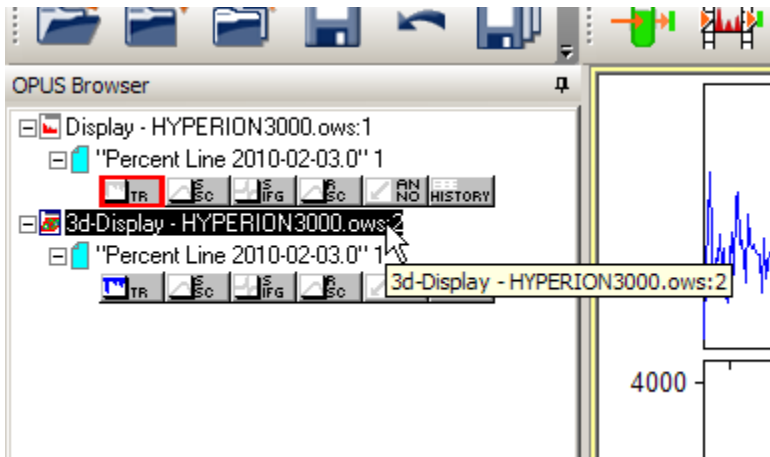
78. The screen should now look similar to the following:

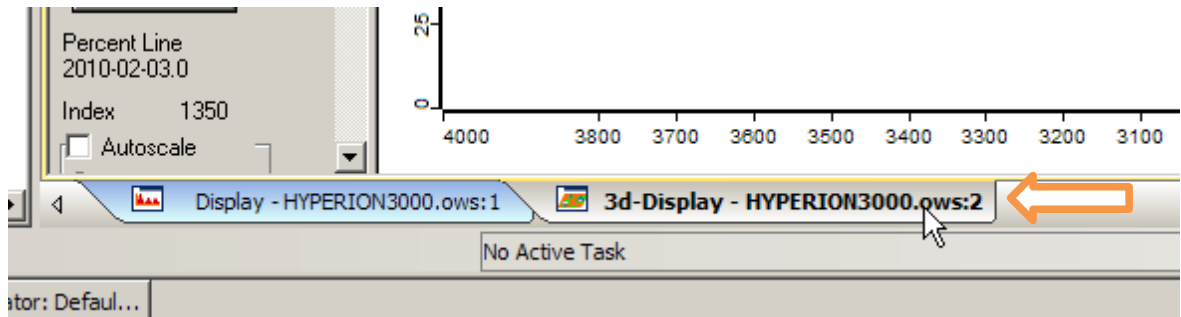


79. Now drag-and-drop the first block of the file to the newly created 3D display window. In this case the first block is the "TR" block – where TR stands for transmission. This could also be labelled AB (absorption), or REFL (reflection), or whatever else was chosen to display in the measurement setup window.

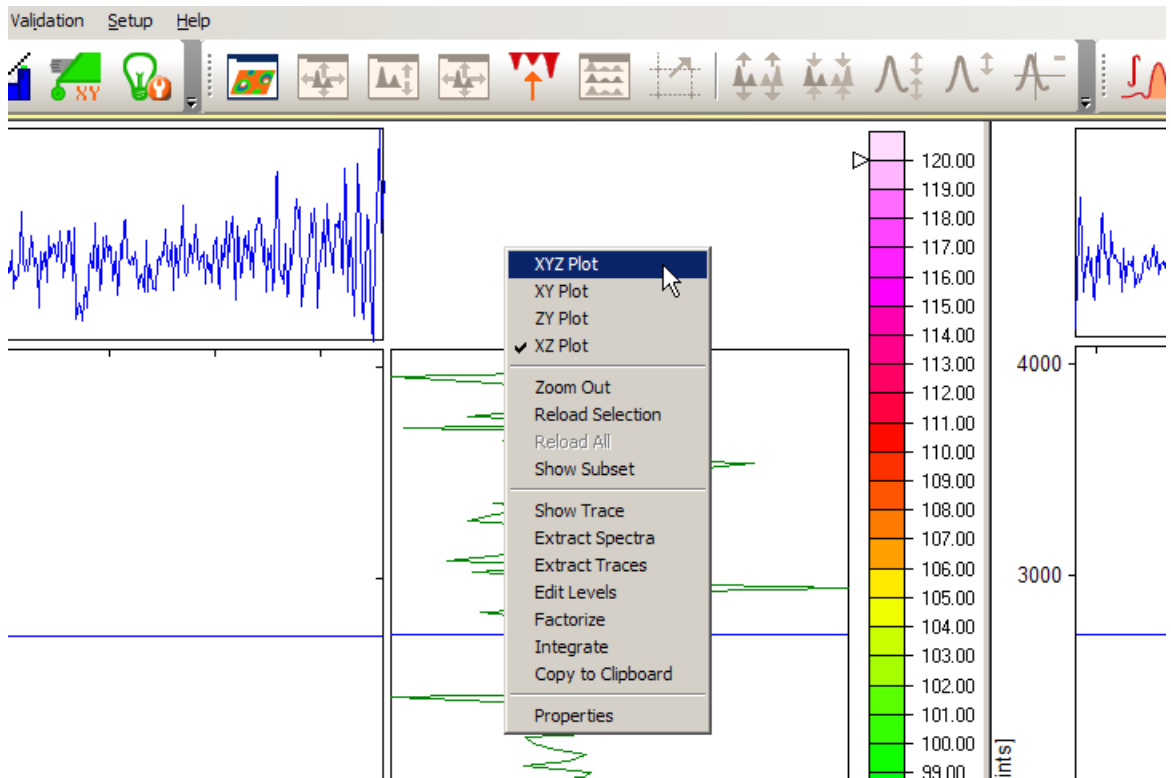


80. If it is not already selected, click either on the “3d-Display - ...” line in the OPUS Browser window, or the tab labelled “3d-Display - ...” on the bottom of the page.

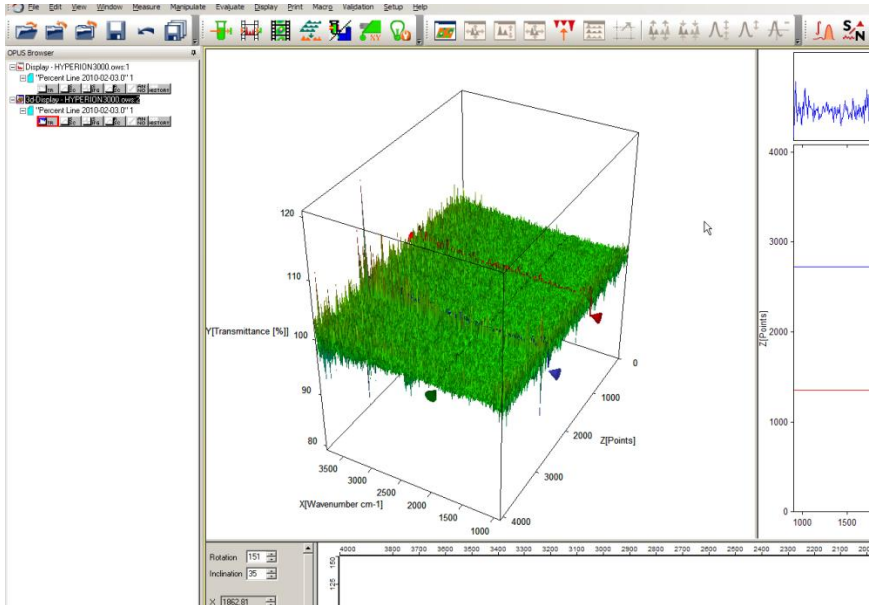




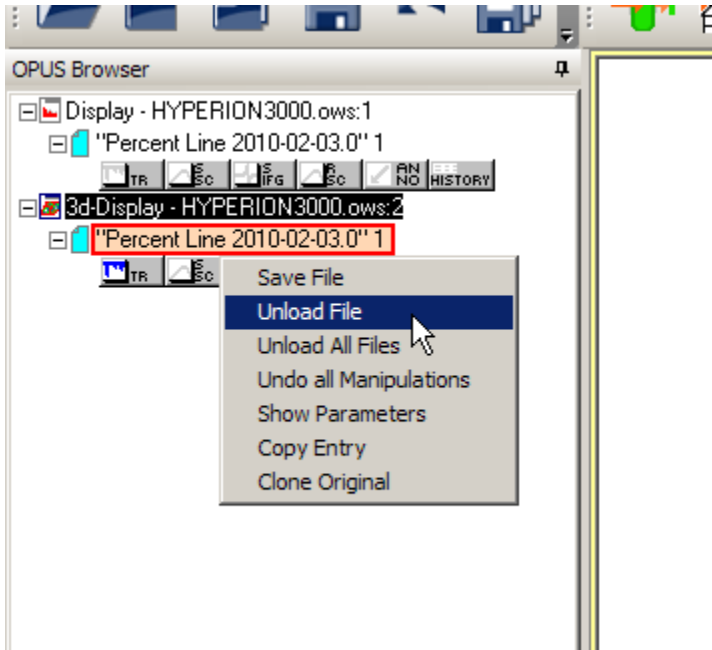
81. The 3d-Display window will default to showing a two-dimensional XZ-plane of the data. This can be changed by right clicking on the XZ-display window, and selecting “XYZ Plot”.



82. Now the display will show a 3D representation of all the acquired spectra.



83. You can now integrate under a peak area to show a map of intensity versus area, or carry out any additional analysis desired.
84. Once done checking the results of the measurement, one needs to unload all files, and close all 3d-Display windows before taking any additional measurements. The original "Display" window needs to remain open. To unload the file right-click on the file name and select "Unload File":



85. Now right click on the 3d-Display line, and select "Close Window" from the pop-up menu.
86. Go back and repeat the above steps for further measurements. Saving the peak position only needs to be done once per day.
87. When you are finished using the microscope turn the power off to the FPA using the same switch from step 2 to turn it on.