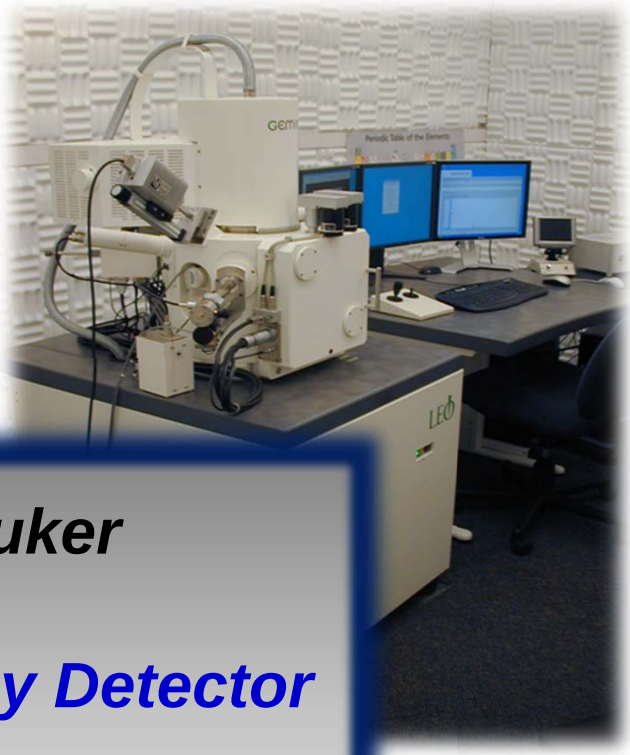
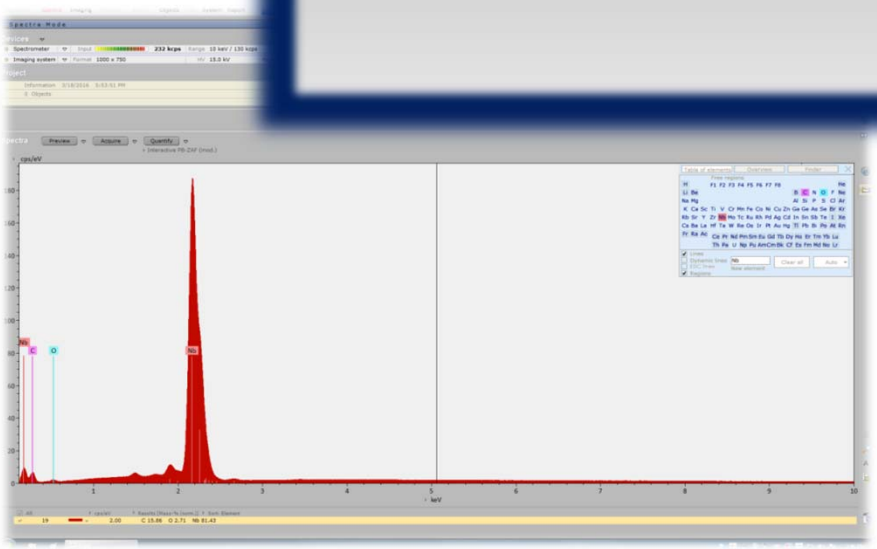
Operating Manual

Part 2



Bruker

SDD X-ray Detector



Contacts

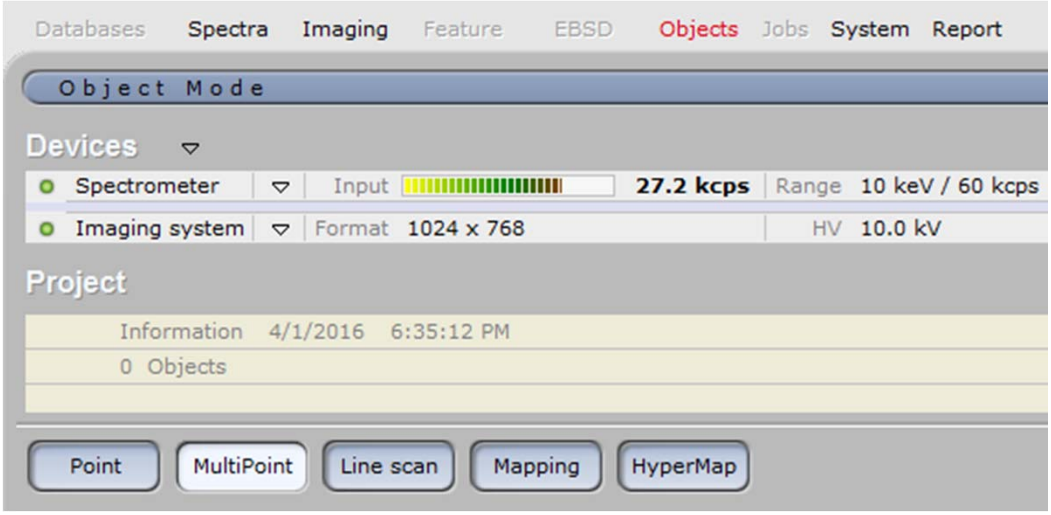
Mick:	255-0650
Cornell Police:	255-5111
Emergency:	911
Phil Carubia:	255-6757

8.00

MultiPoint Mode

Step 1 - setup:

Select Objects and click on MultiPoint

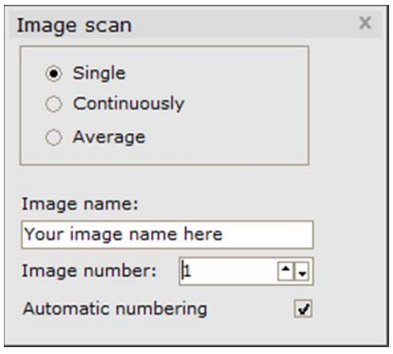


Set the EHT to ~4X the highest energy edge you will be measuring.

Set the aperture to 60um to 230um aperture for high count rates.

Set the working distance to 7mm +/- 1mm.

Click on the triangle next to New



Select the desired shape

Multiple shapes can be selected for sequential acquisition.

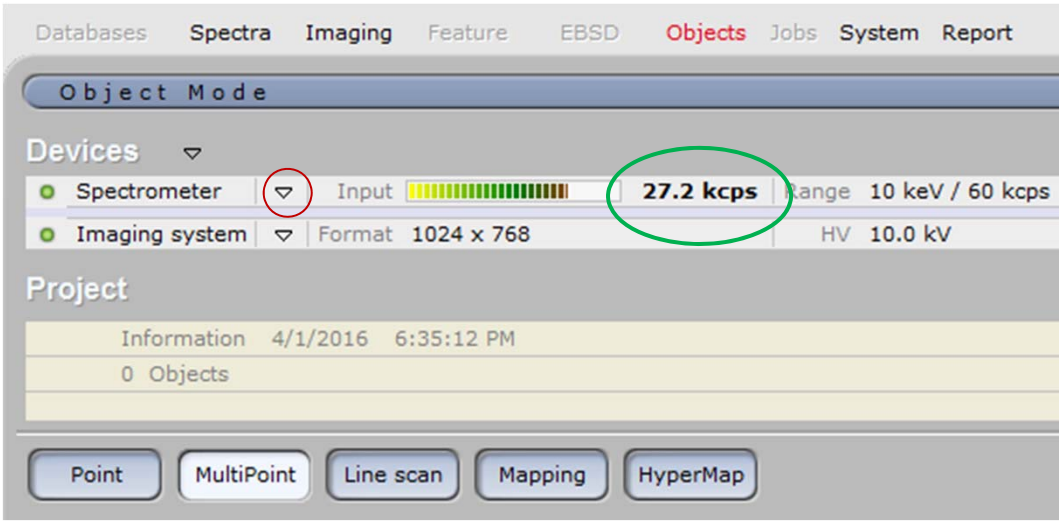
Automatic selection of shape locations can also be chosen.

8.00

Step 1 – setup (continued):

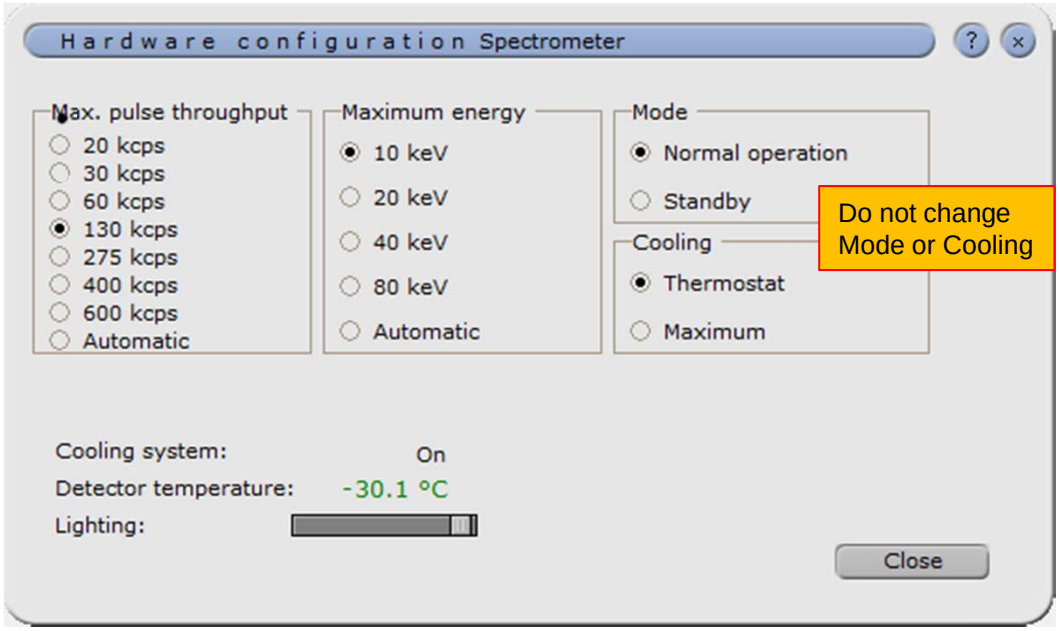
Note the count rate (green circle).

Click on the triangle next to Spectrometer.



Choose the Max. pulse throughput to be just above the kcps value.

Choose the Maximum energy to include all the edges you are analyzing.

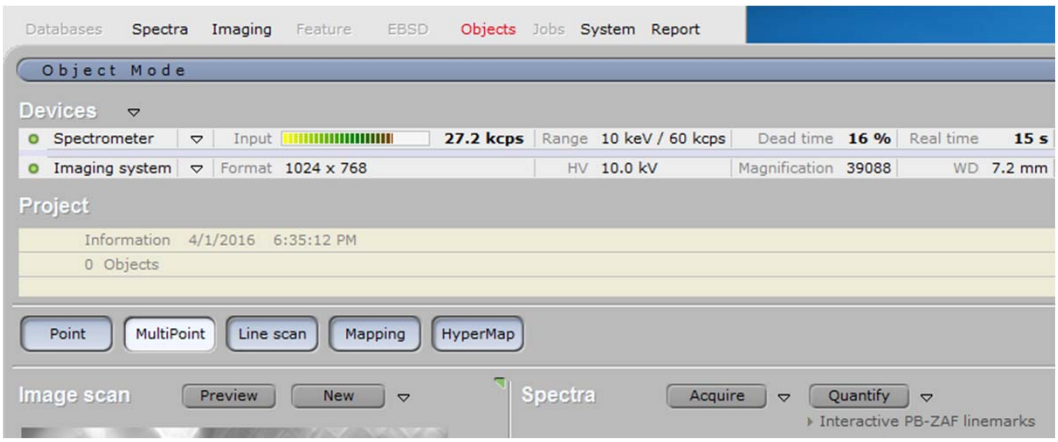


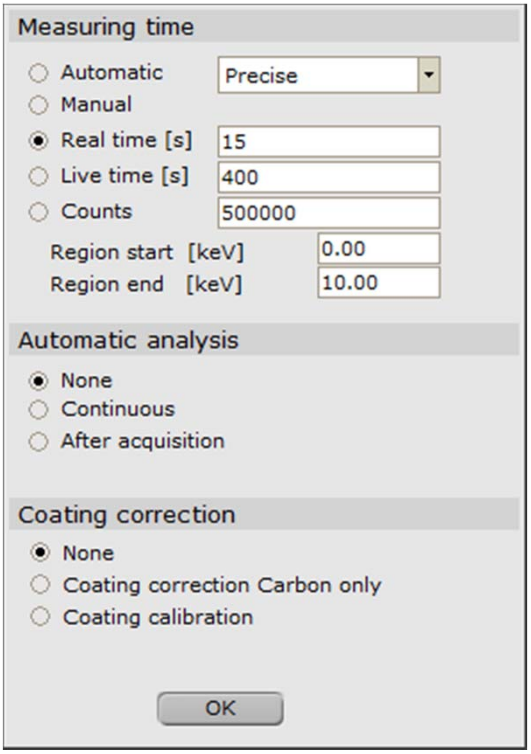
8.00

Multiple Points

Step 1 setup (continued):

Click on the triangle next to Acquire.





Set the Real time (or Live time) as desired. Note Real Time = Live Time + Dead Time

.

If you enter a Spectrum name and check Automatic numbering then that name and incremental number will be assigned to your spectra.

Click on OK

MultiPoint Mode

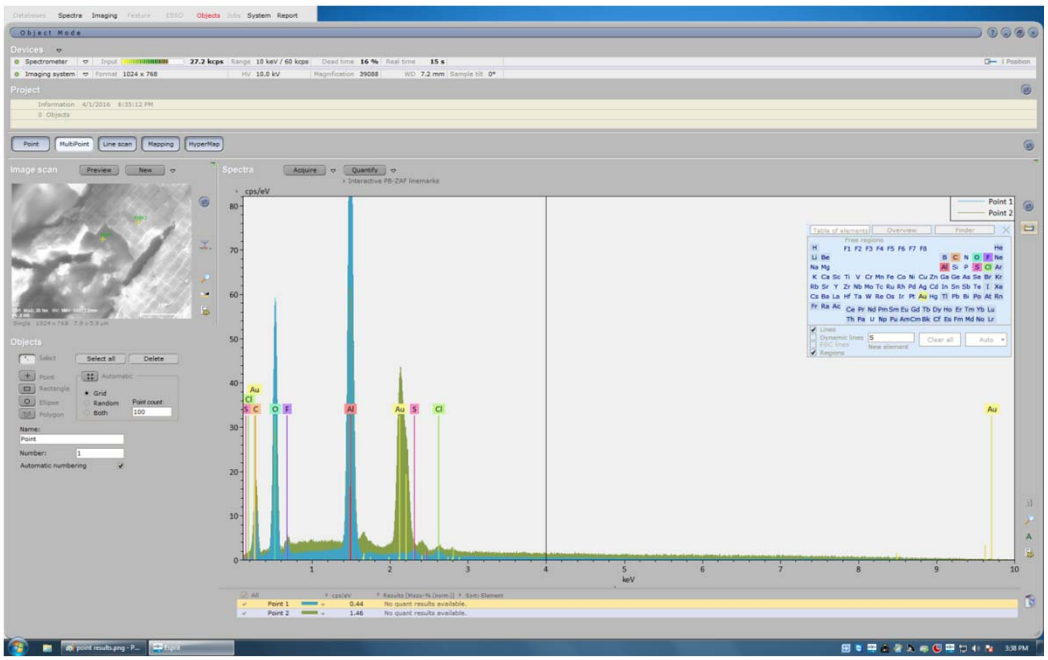
Step 2 - acquisition:

Click on Acquire to collect spectra

The spectra will appear in real time until the acquisition has finished.

Clicking on the icon on the right side of the screen will enable the periodic table to appear

A separate spectra will show up for each Point/Rectangle/Ellipse/Polygon

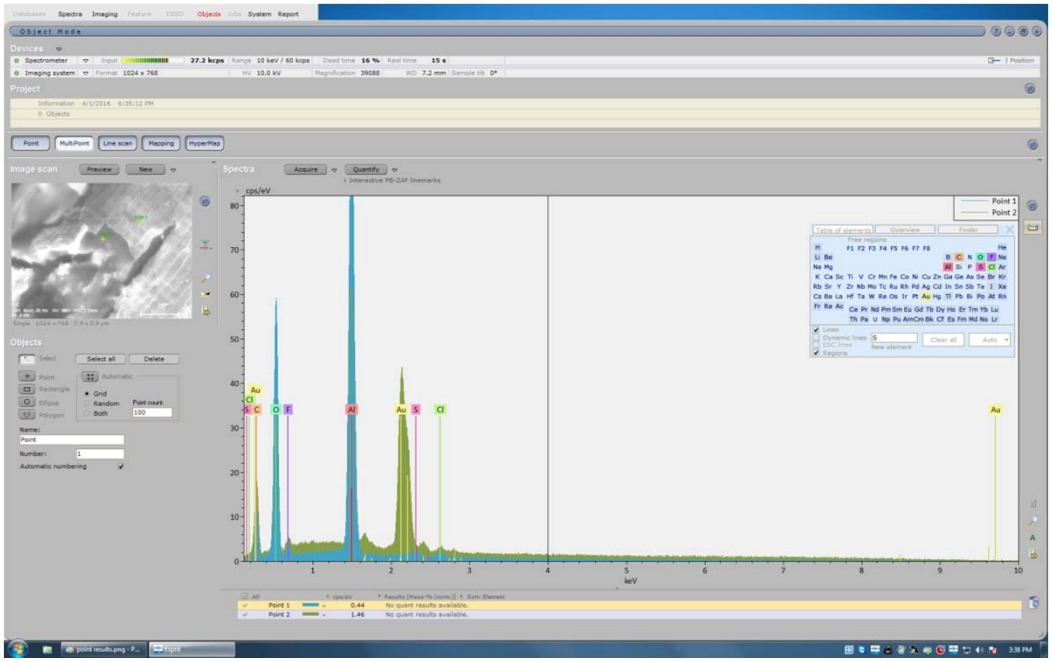


Click on the Auto button Auto ▾ to automatically identify the peaks or click on the element in the Periodic Table to manually identify the peaks,

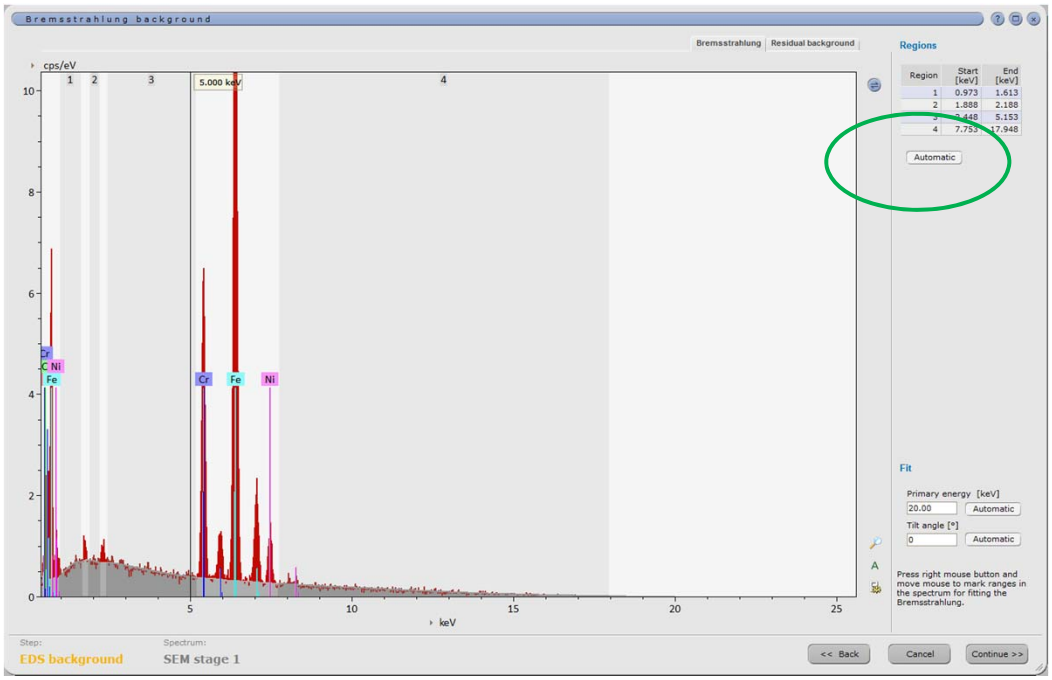
8.00

Step 3 - quantification:

To quantify the elements choose a spectra and click on Quantify



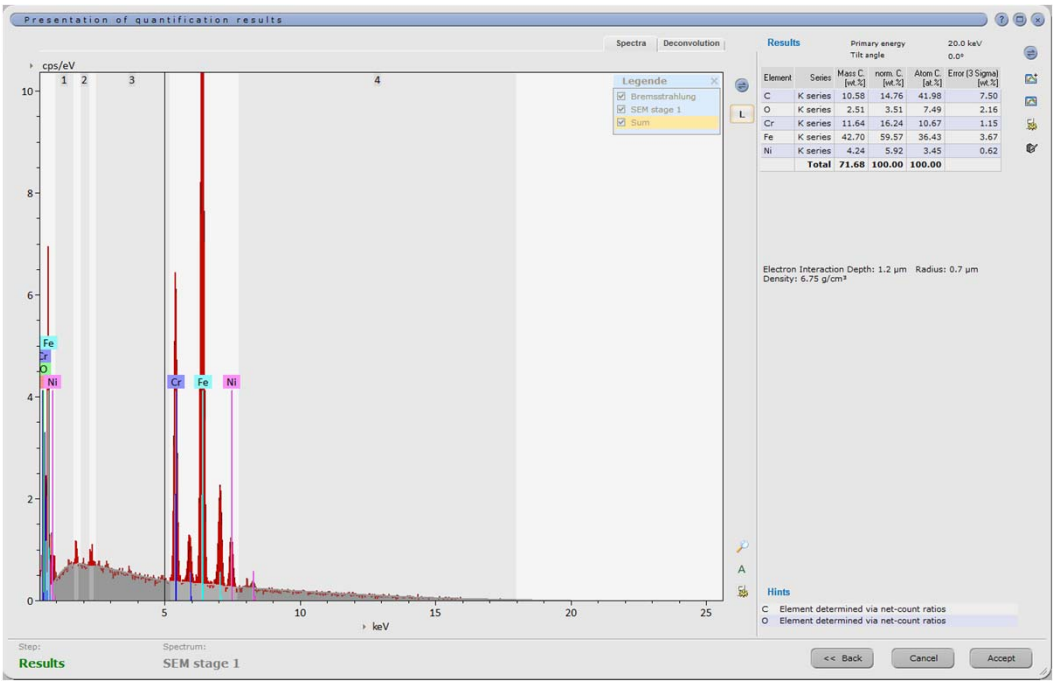
Click on Automatic



8.00

Step 3 – quantification (continued):

Note a result table has showed up in the corner:



Click on Accept

Results Primary energy 20.0 keV; Tilt angle 0.0°

Element	Series	Mass C. [wt.%]	norm. C. [wt.%]	Atom C. [at.%]	Error (3 Sigma) [wt.%]
C	K series	10.58	14.76	41.98	7.50
O	K series	2.51	3.51	7.49	2.16
Cr	K series	11.64	16.24	10.67	1.15
Fe	K series	42.70	59.57	36.43	3.67
Ni	K series	4.24	5.92	3.45	0.62
	Total	**71.68**	**100.00**	**100.00**	

Electron Interaction Depth: 1.2 µm Radius: 0.7 µm
Density: 6.75 g/cm³

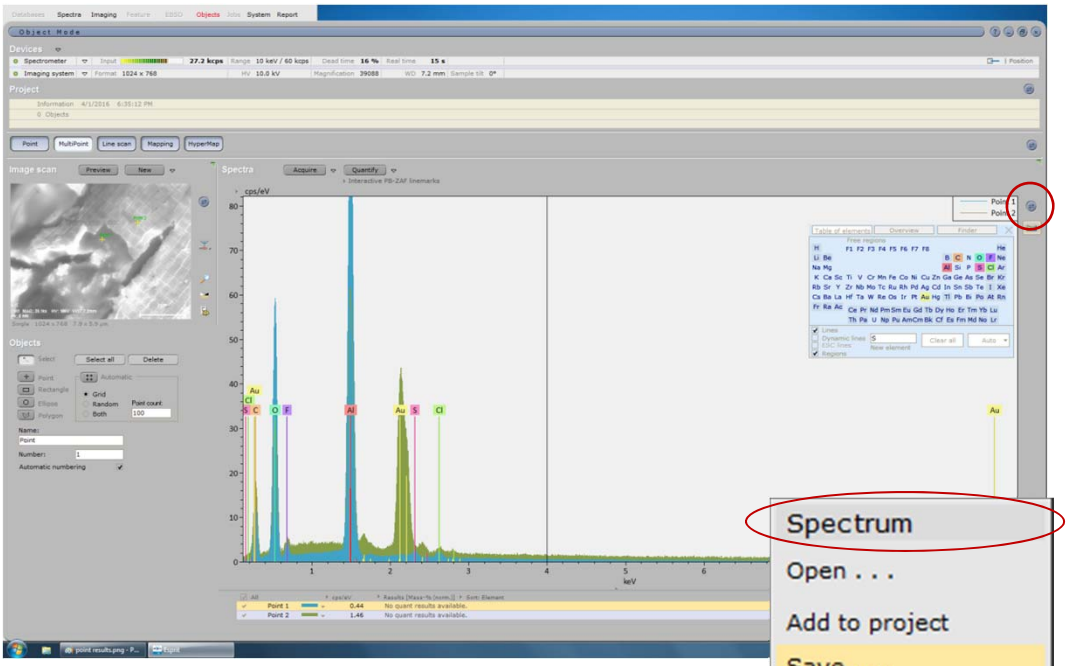
The software displays the results in several ways.

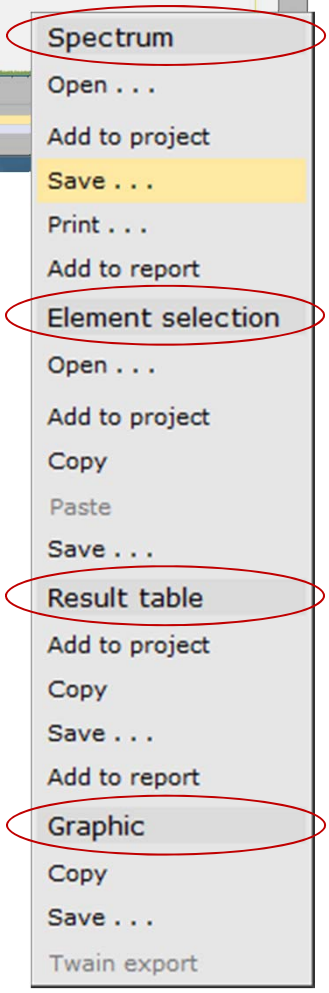
Note also that the electron interaction depth and radius are provided.

8.00

Step 4 – saving data:

Click on the icon as shown.





There are four types of data that can be saved:

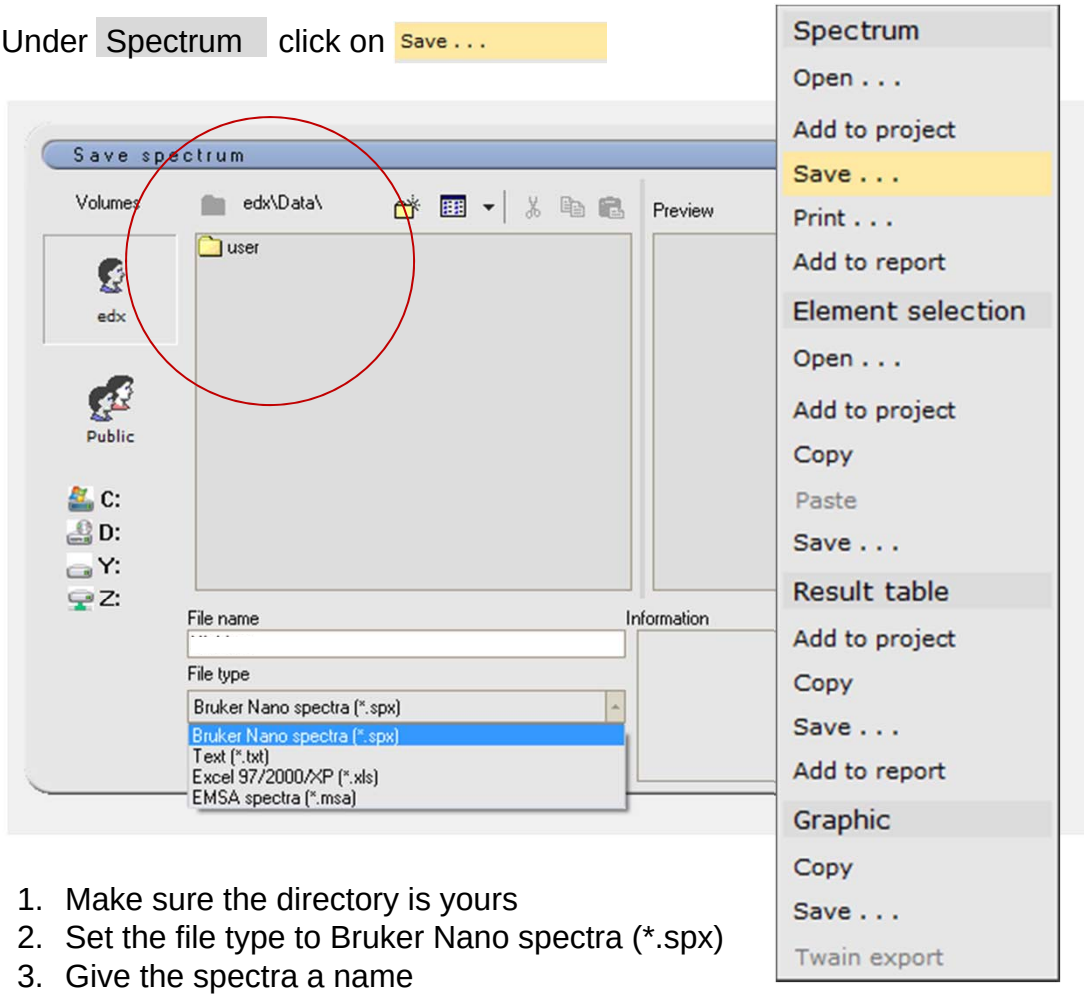
1) Spectrum
2) Element selection
3) Result table
4) Graphic

8.00

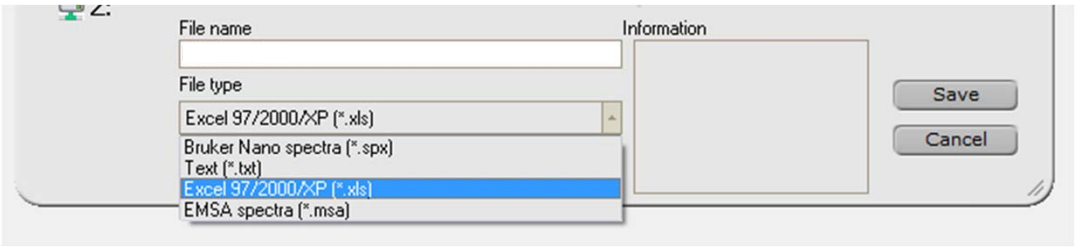
Step 4 – saving the data:

Saving the spectra:

Under Spectrum click on Save . . .



1. Make sure the directory is yours
2. Set the file type to Bruker Nano spectra (*.spx)
3. Give the spectra a name
4. Click on Save



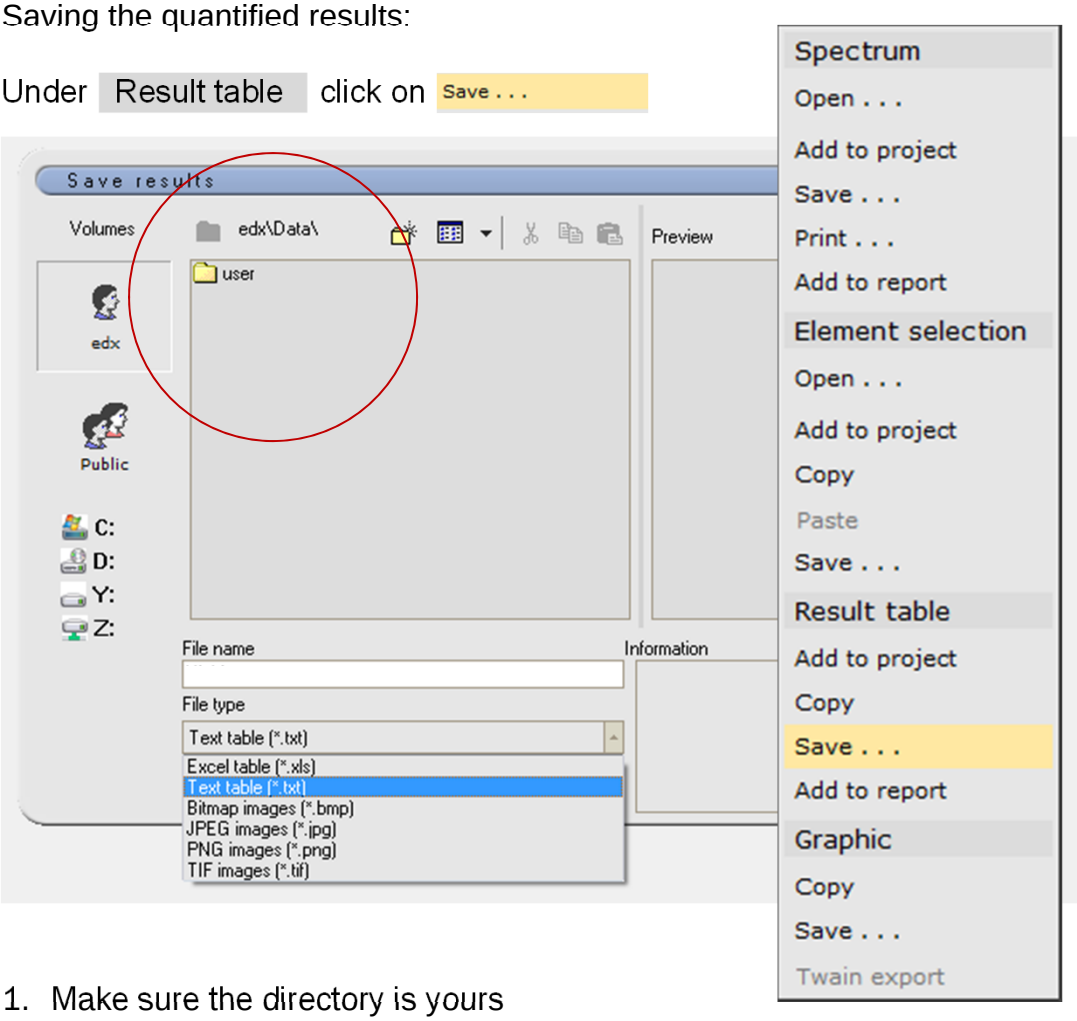
5. Under Spectrum click on Save . . . again
6. Set the file type to Excel 97/2000/XP (*.xls)
7. The same file name should populate the File name box
8. Click on Save

8.00

Step 4 – saving the data:

Saving the quantified results:

Under Result table click on Save . . .



1. Make sure the directory is yours
2. Set to Text table (*.txt)
3. The same file name should populate the box with a .txt extension
4. Click on Save

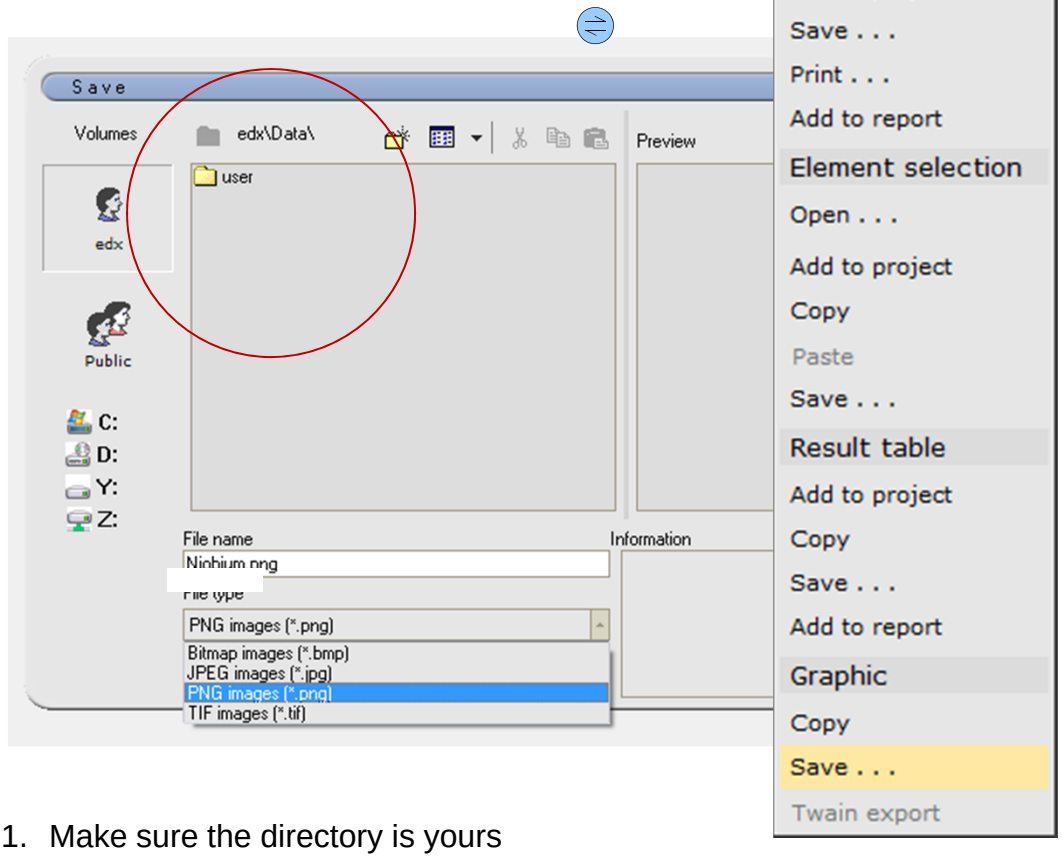
MultiPoint Mode

Step 4 saving the data (continued):

Saving images of spectra:

Important!! Saving an image of the spectra does NOT save the raw data!!!
Image files CANNOT be quantitatively analyzed!!

Under Graphic click on Save . . .

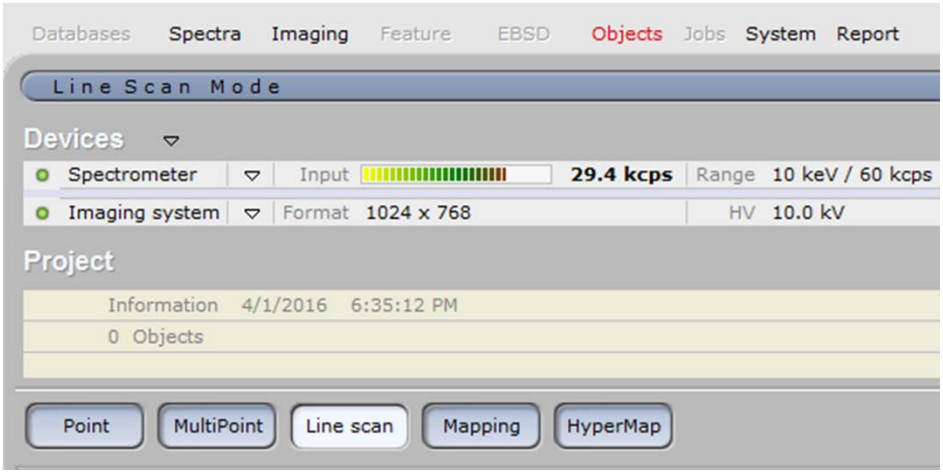


1. Make sure the directory is yours
2. Set to the file type you want (e.g. .png)
3. Type in the same filename as for your data files
4. Click on Save

Linescan Mode

Step 1 - setup:

Select Objects and click on Linescan



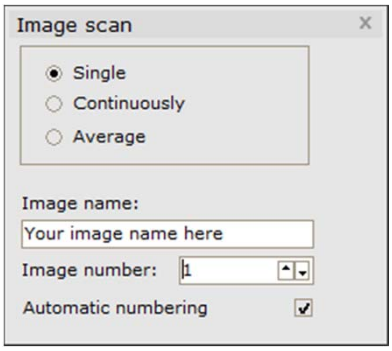
Set the EHT to ~4X the highest energy edge you will be measuring.

Set the aperture to 60um to 230um aperture for high count rates.

Set the working distance to 7mm +/- 1mm.

Click on the triangle next to New

Click on Single (most common)



The point count determines the number of spectra across the image.

Or you can set the desired distance you want to cover

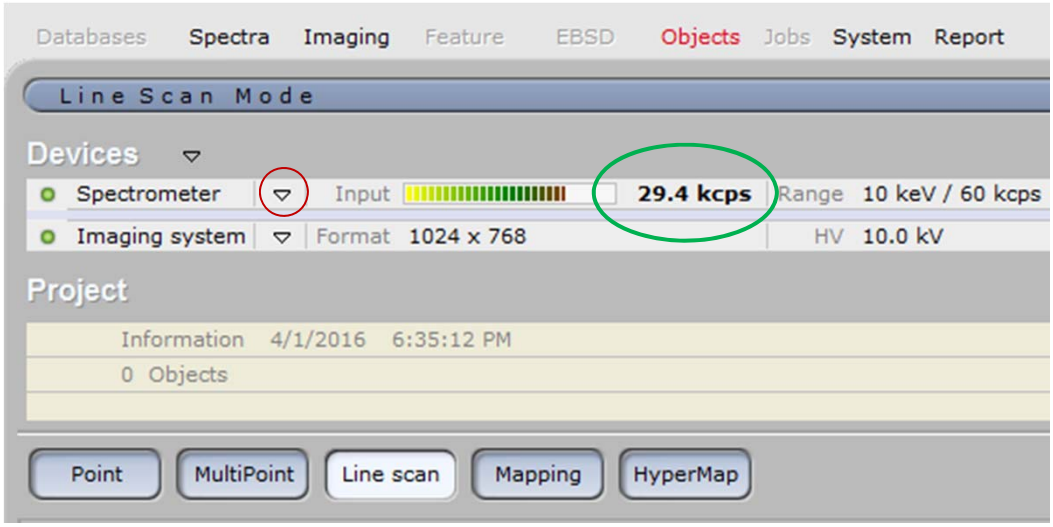
Click on the image to set the measurement line

9.00

Step 1 – setup (continued):

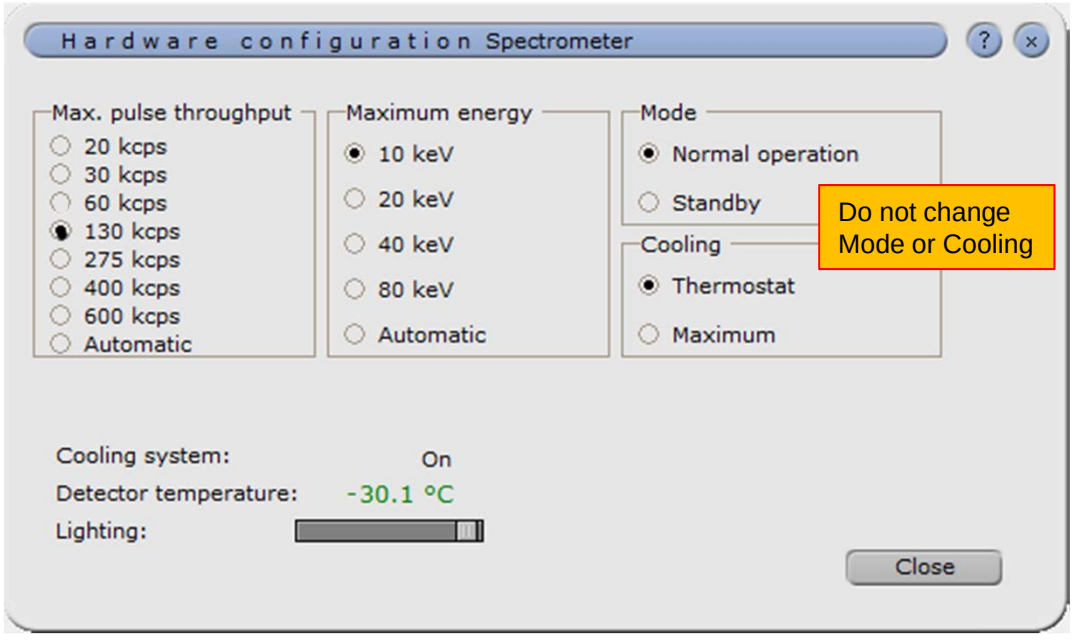
Note the count rate (green circle).

Click on the triangle next to Spectrometer.



Choose the Max. pulse throughput to be just above the kcps value.

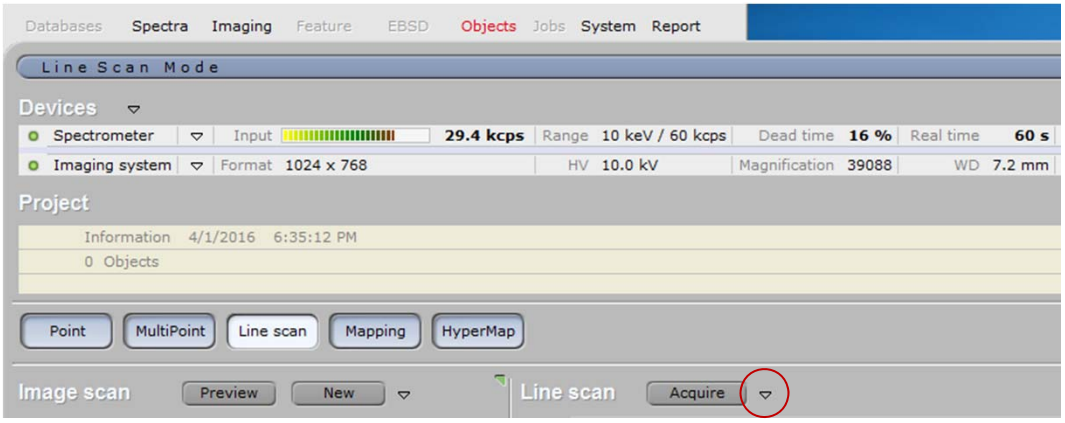
Choose the Maximum energy to include all the edges you are analyzing.



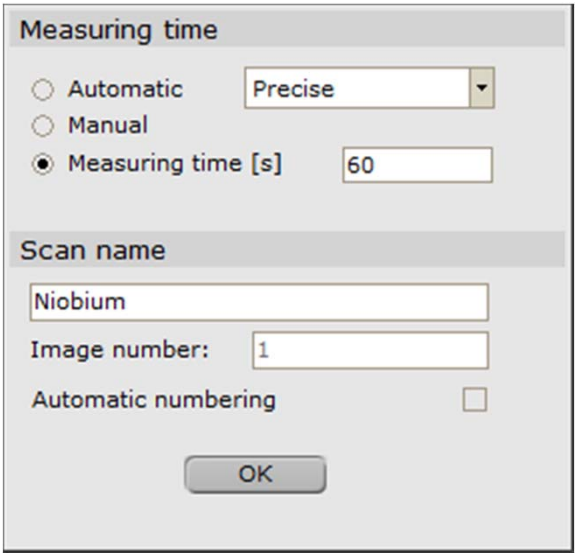
9.00

Step 1 setup (continued):

Click on the triangle next to Acquire



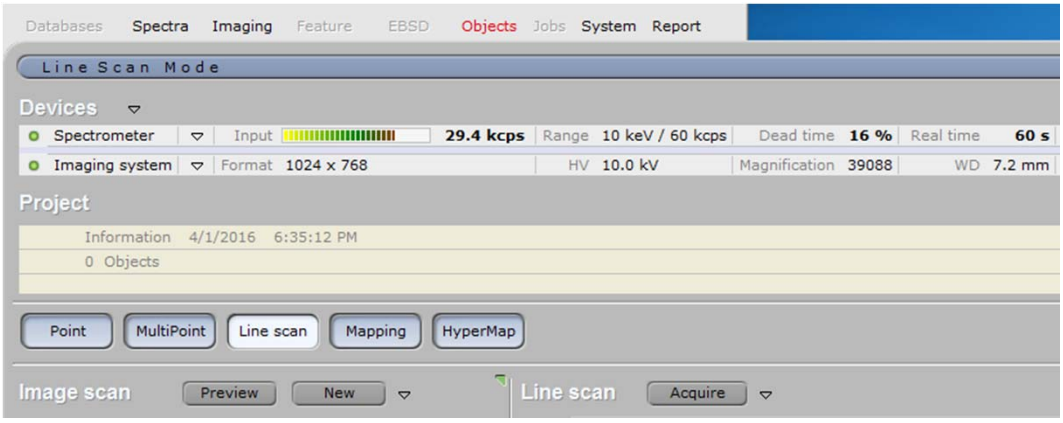
Set the measuring time



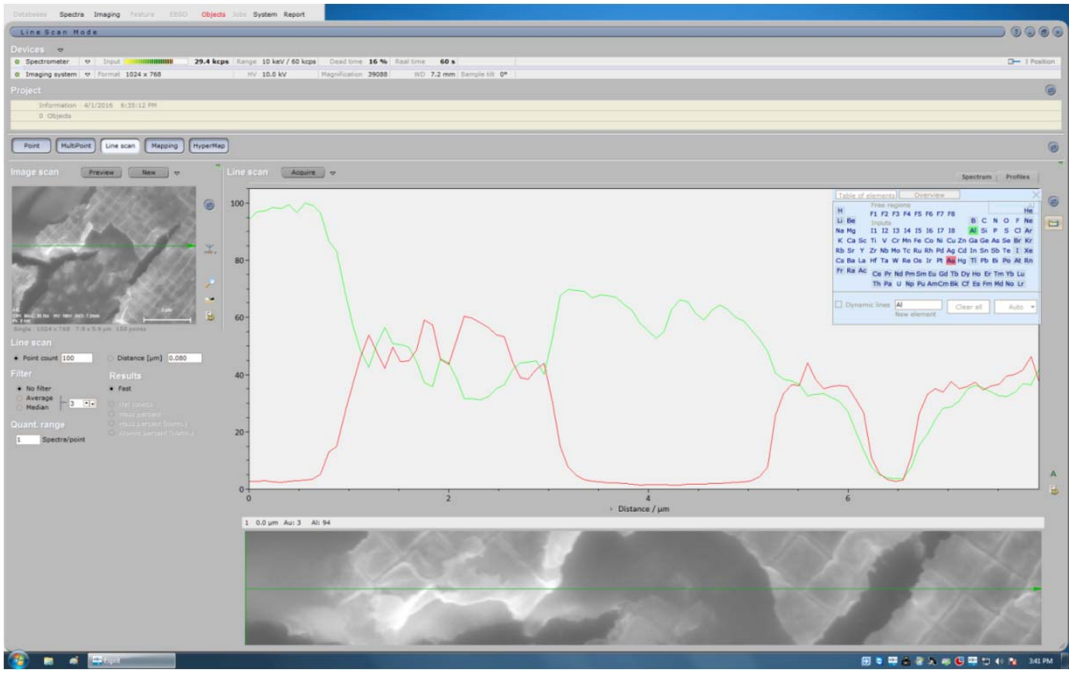
9.00

Step 2 - acquisition:

Click on Acquire



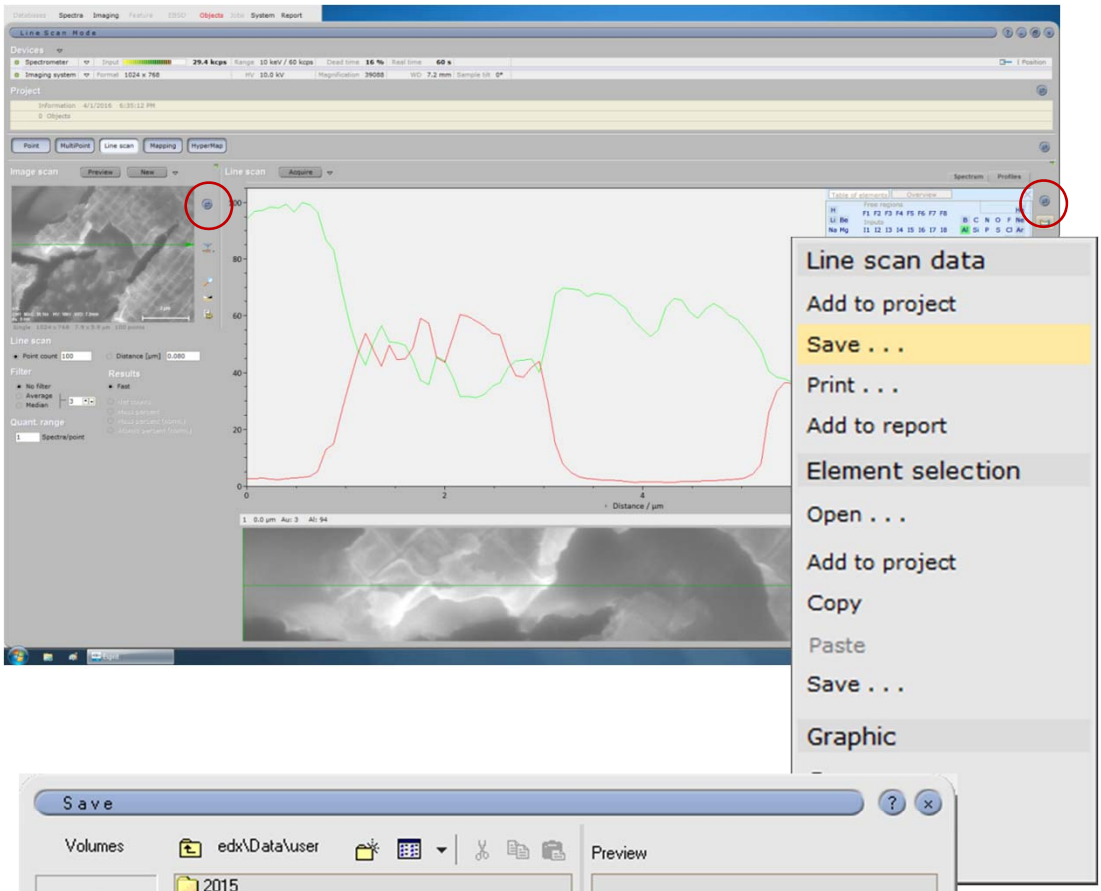
Results are displayed as shown below

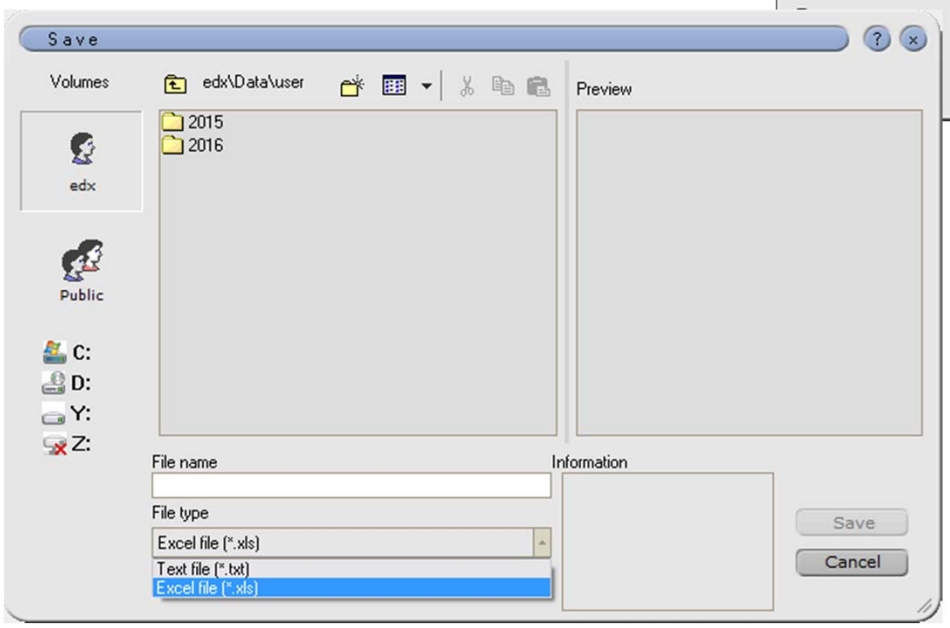


9.00

Stap 3 – Saving the data:

Click on the next to the line scan to save the linescan.

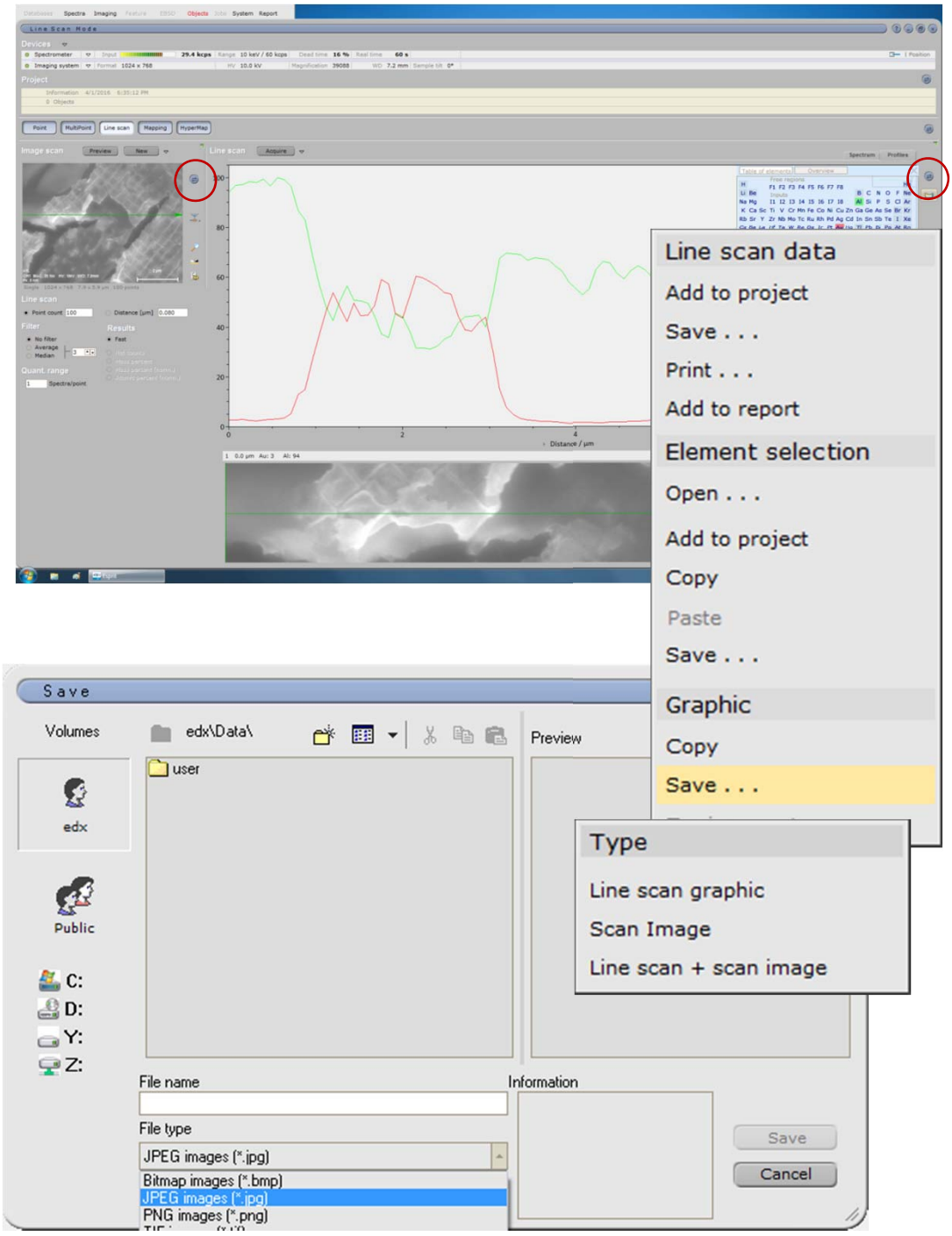




9.00

Stap 3 – Saving the data:

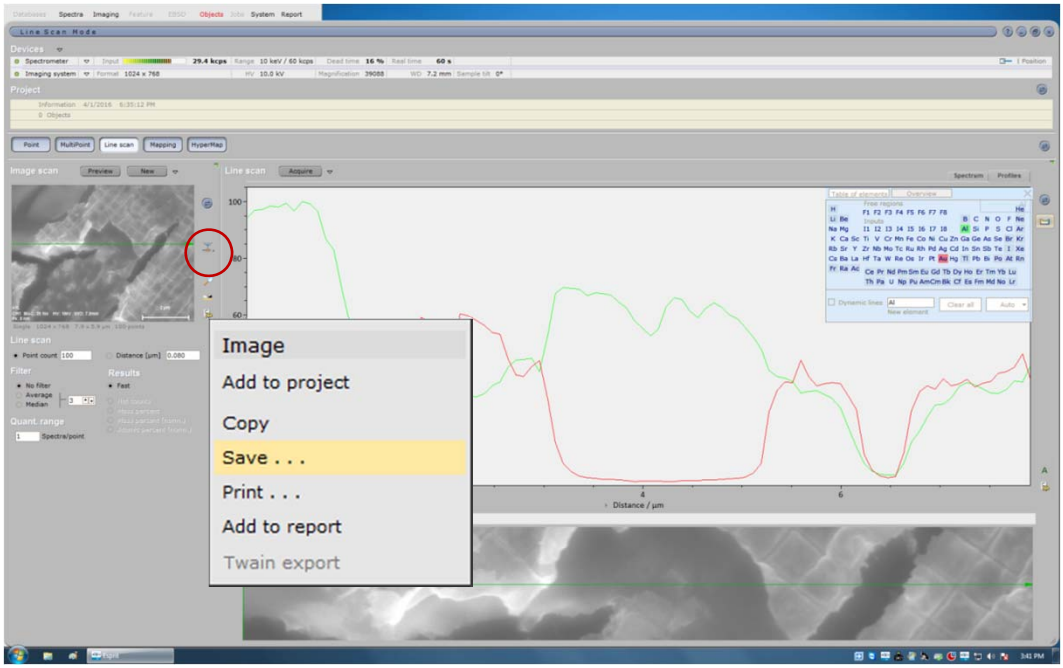
Click on the next to the line scan to save the linescan data:

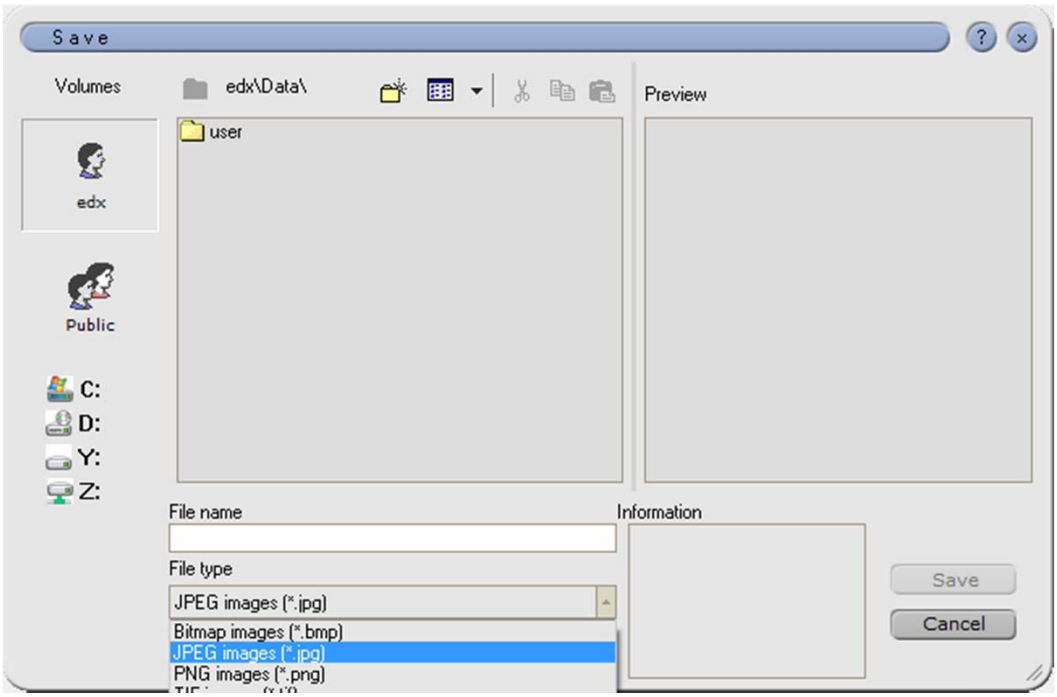


9.00

Stap 3 – Saving the data:

Click on the next to the image to save the image.





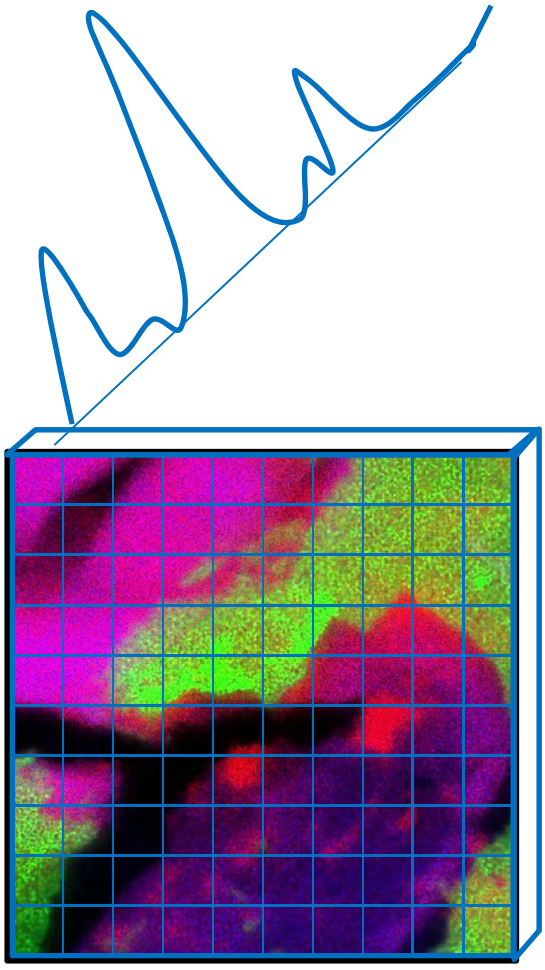
10.00

Principles of X-ray mapping:

In an X-ray map a spectra is recorded at each pixel in the image.

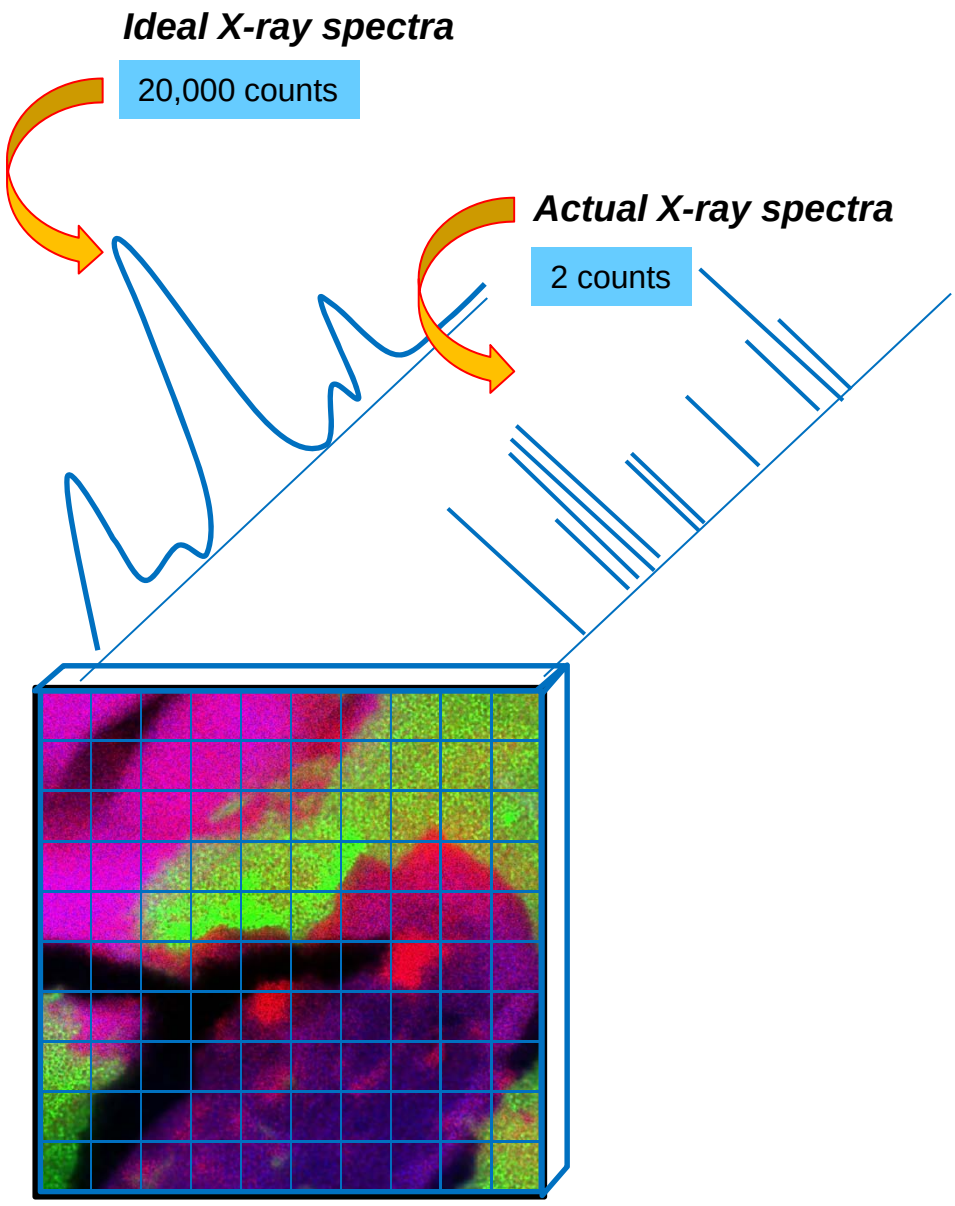
The intensity of the chosen element(s) is then plotted at each pixel .

The map below shows oxygen (in Blue), aluminum (in Red), gold (in **Green**), When multiple elements are present, combinations of color can be created (e.g. aluminum (blue) and oxygen (red) show up as purple).



Principles of X-ray mapping:

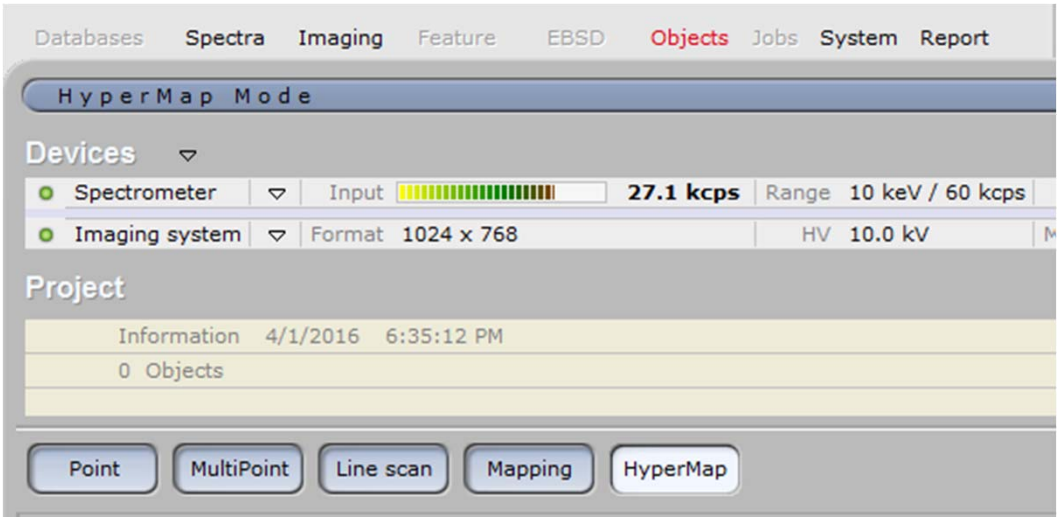
Note that short acquisitions times (or order of milliseconds/pixel) are usually required due to the large number of pixels typically involved. As a result spectra collected in mapping mode are usually very noisy compared to other acquisition modes..



10.00

Step 1 - setup:

With Objects selected click on HyperMap

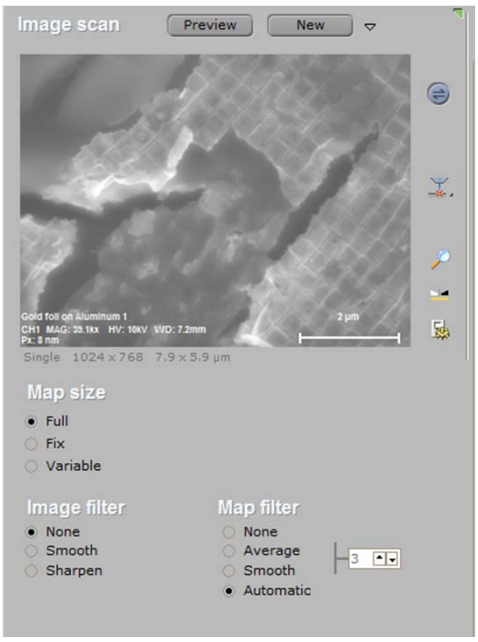


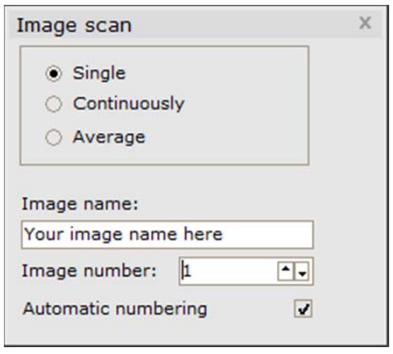
Set the EHT to ~4X the highest energy edge you will be measuring.

Set the aperture to 60um to 230um aperture for high count rates.

Set the working distance to 7mm +/- 1mm.

Click on the triangle next to New





Select the Map size

Generally leave Image Filter at None

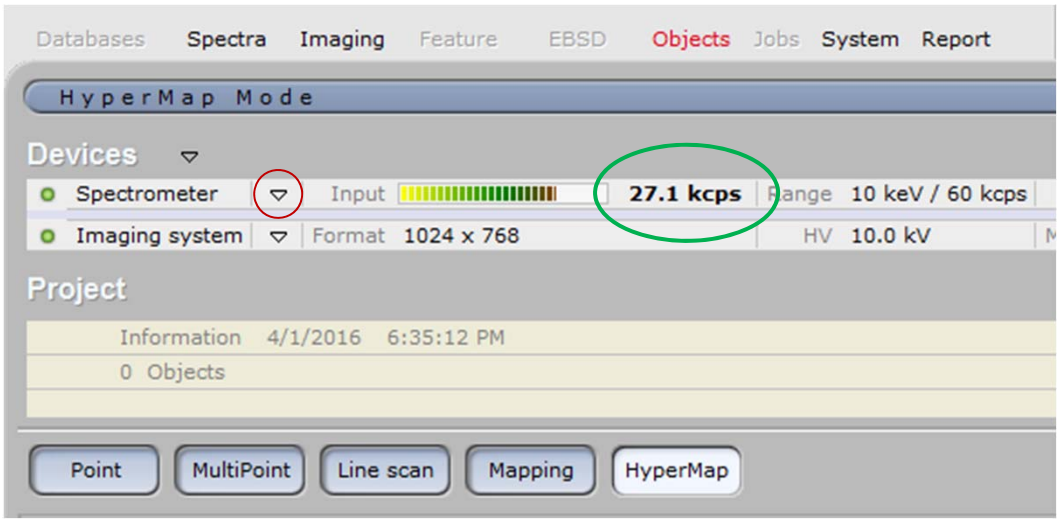
Generally leave Map Filter at Automatic

X-ray mapping

Step 1 – setup (continued):

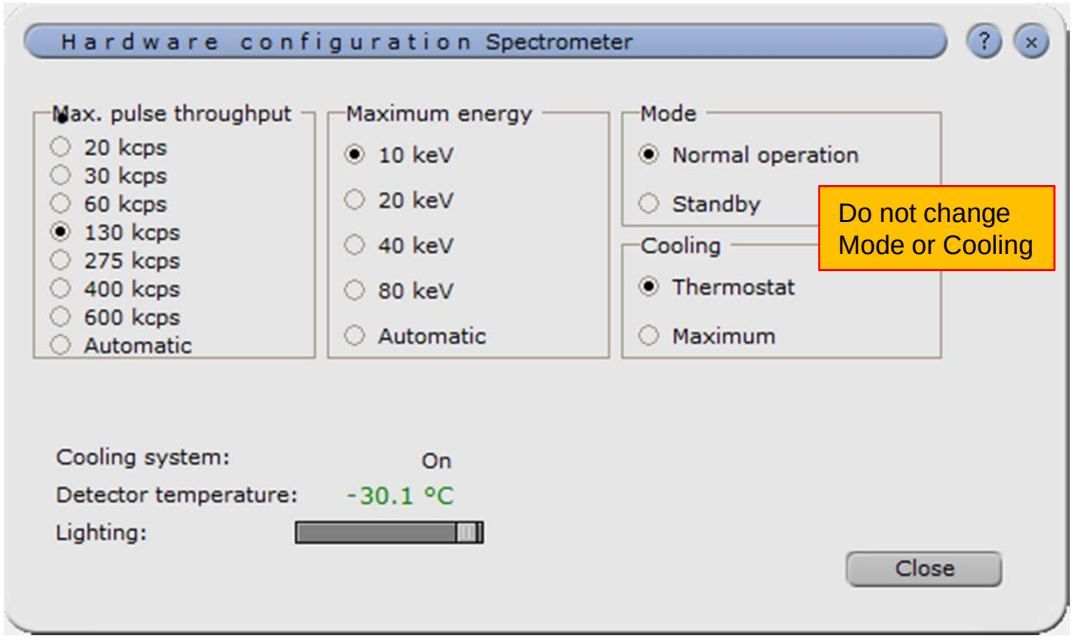
Note the count rate (green circle).

Click on the triangle next to Spectrometer.



Choose the Max. pulse throughput to be just above the kcps value.

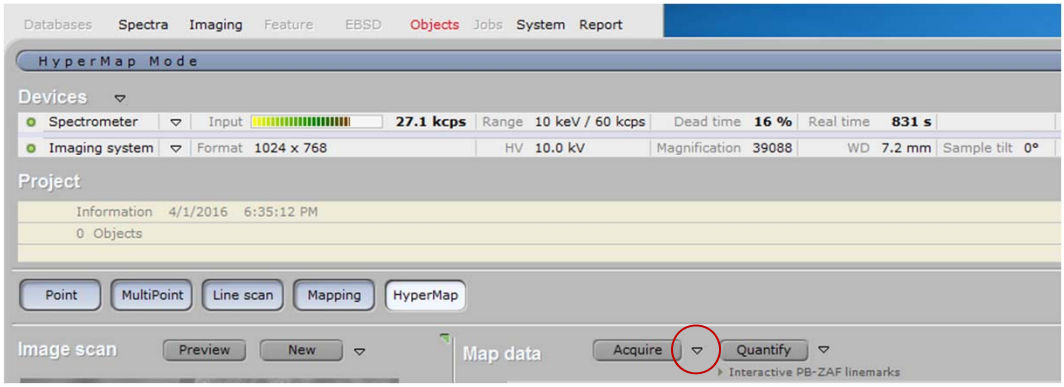
Choose the Maximum energy to include all the edges you are analyzing.

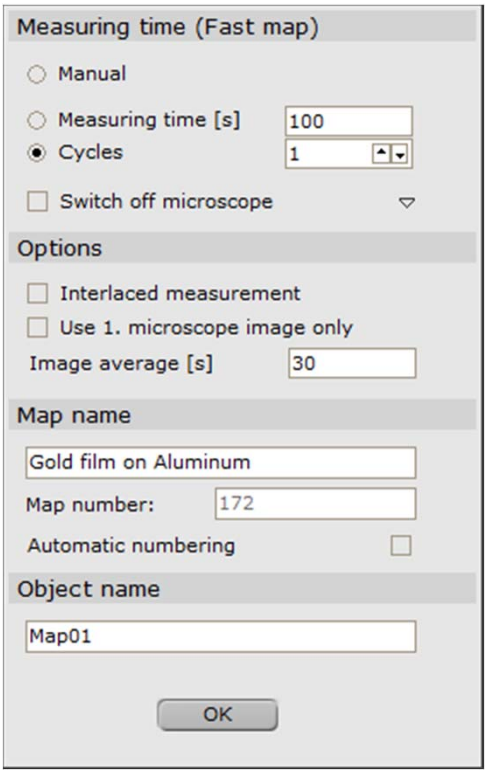


10.00

Step 1 – setup (continued):

Click on the triangle next to Acquire





Click on Cycles and set to 1

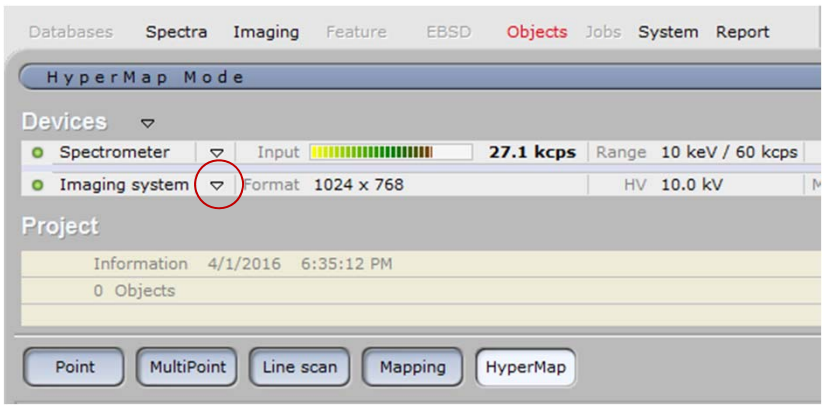
Give the map a name, if desired

Click on OK

10.00

Step 1 – setup (continued):

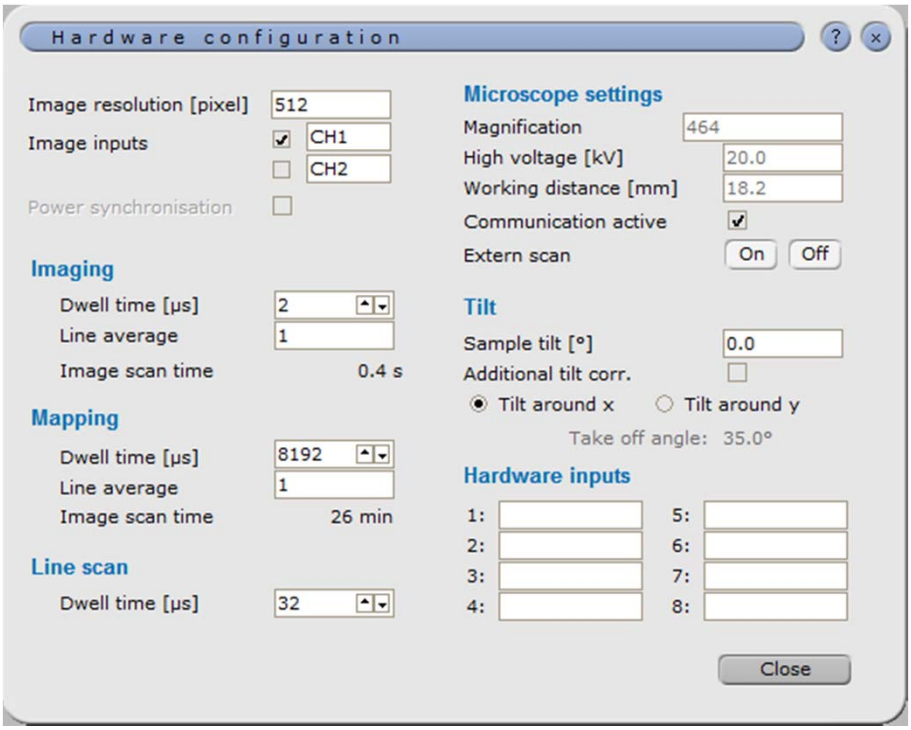
Click on the triangle next to Imaging System



In the window that opens (see below) set the dwell time in microseconds.

A long dwell time will result in better S/N but can take a very long time.

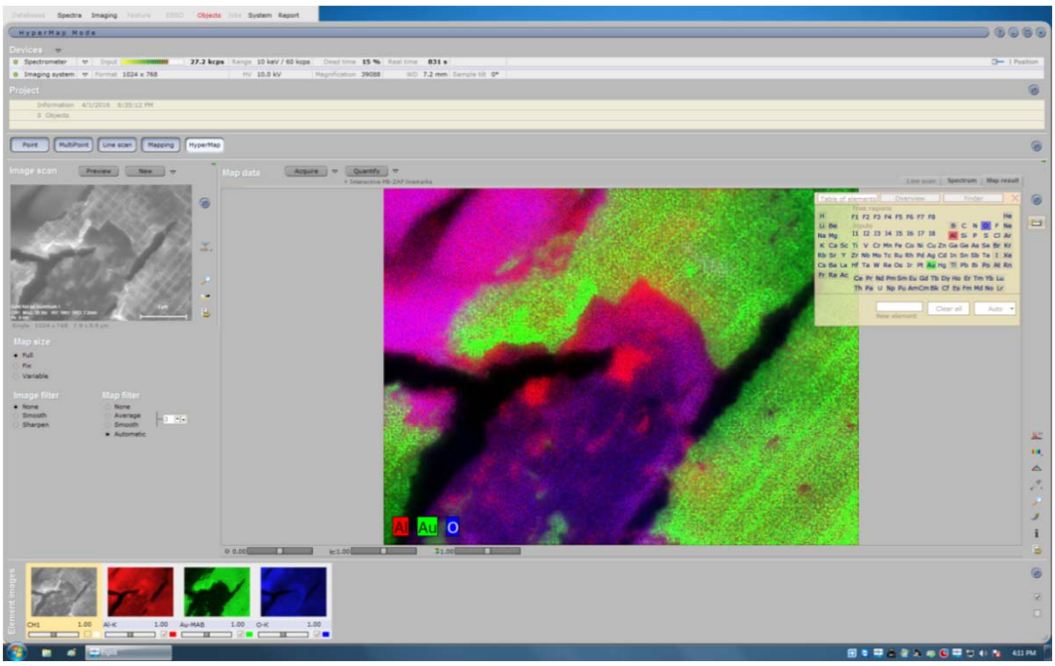
To speed things up, use as large an aperture as you can to get the strongest signal.



10.00

Step 2 – acquisition:

Click on Acquire



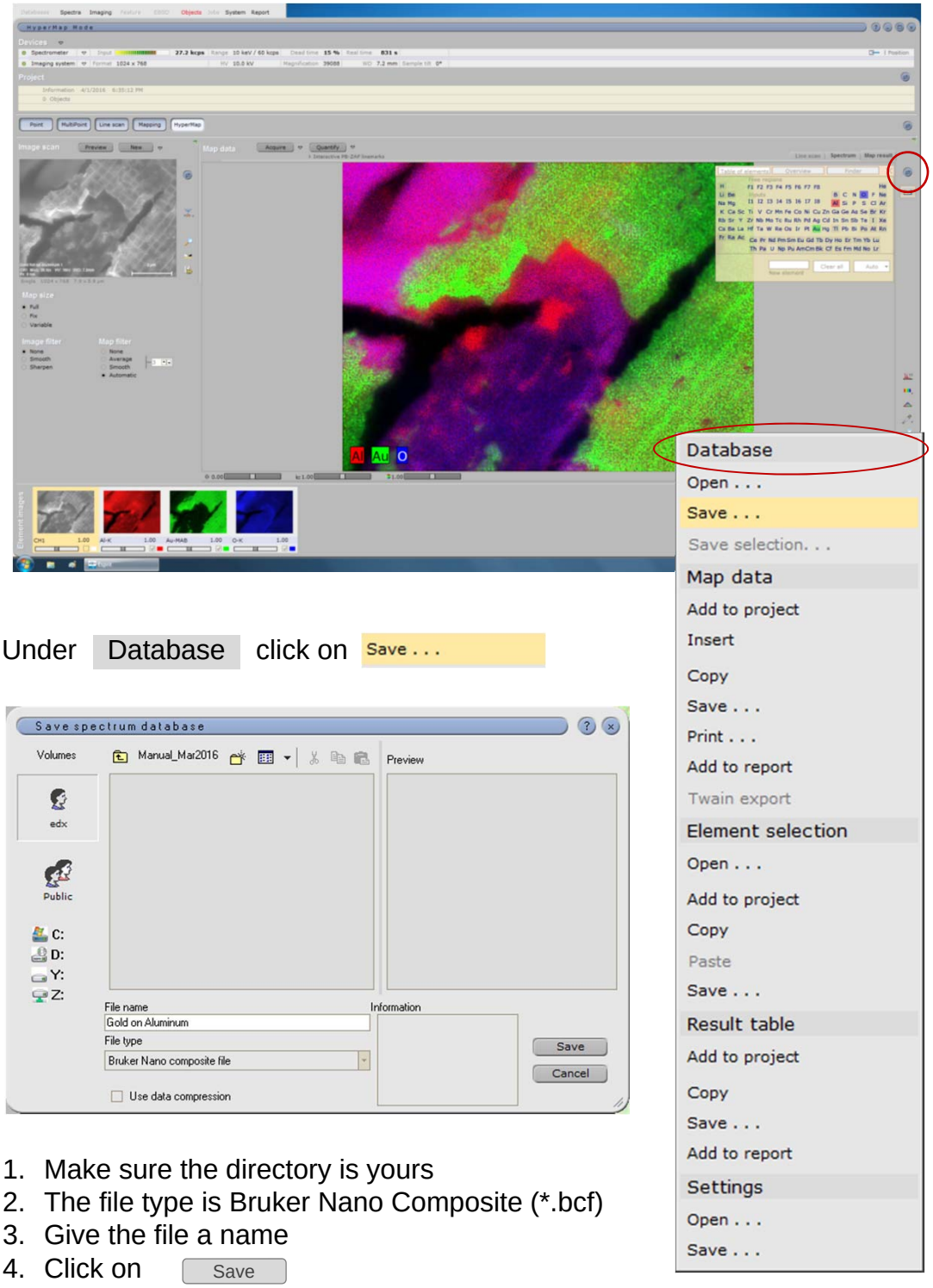
The individual maps are shown in the lower left corner

The large composite map is comprised of all the signals checked in the lower images

10.00

Step 3 – saving data:

Most important – save the raw data: Click on the icon as shown.



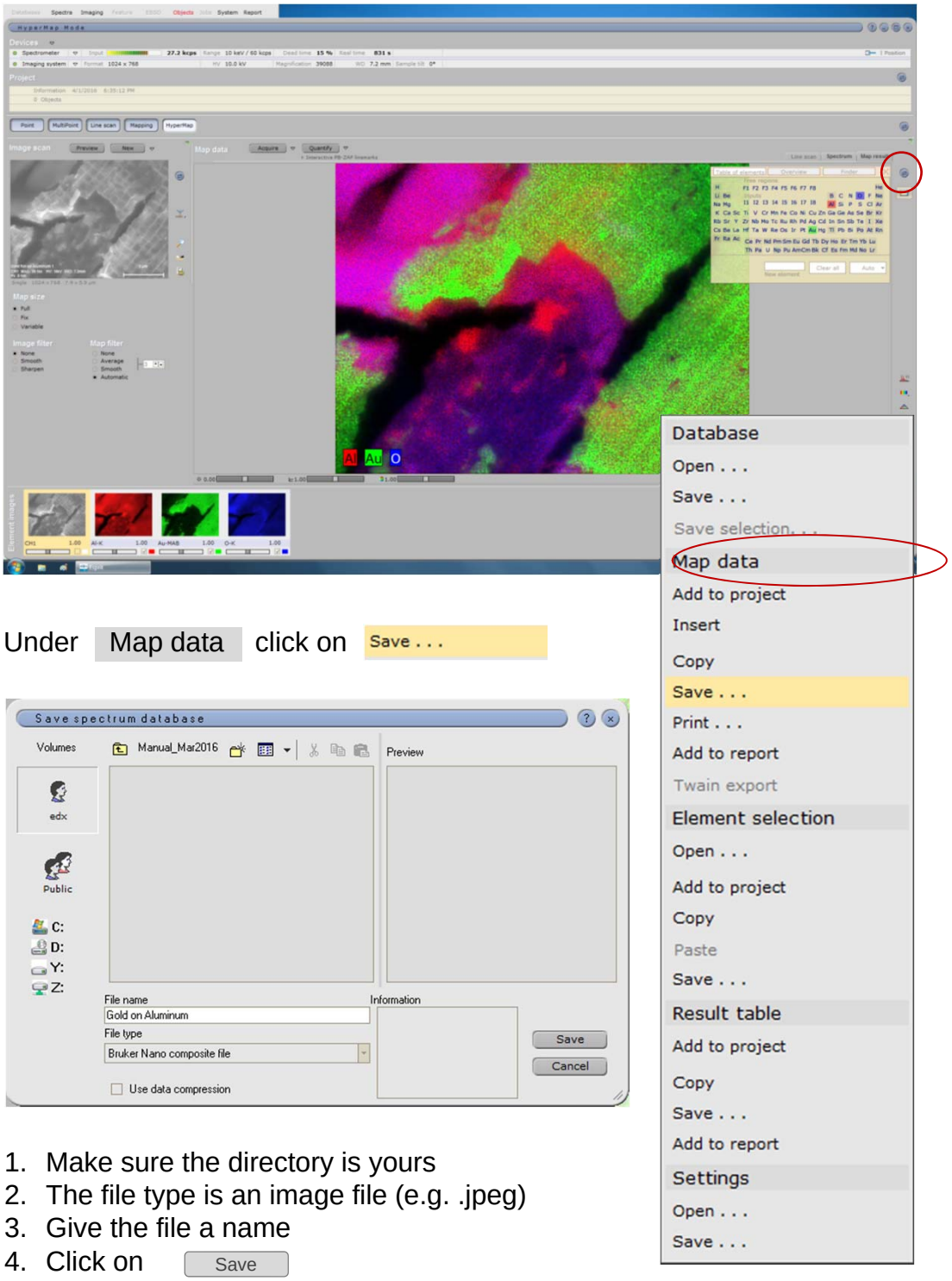
Under Database click on Save . . .

1. Make sure the directory is yours
2. The file type is Bruker Nano Composite (*.bcf)
3. Give the file a name
4. Click on Save

10.00

Step 3 – saving data (continued):

Saving the composite image: Click on the icon as shown.



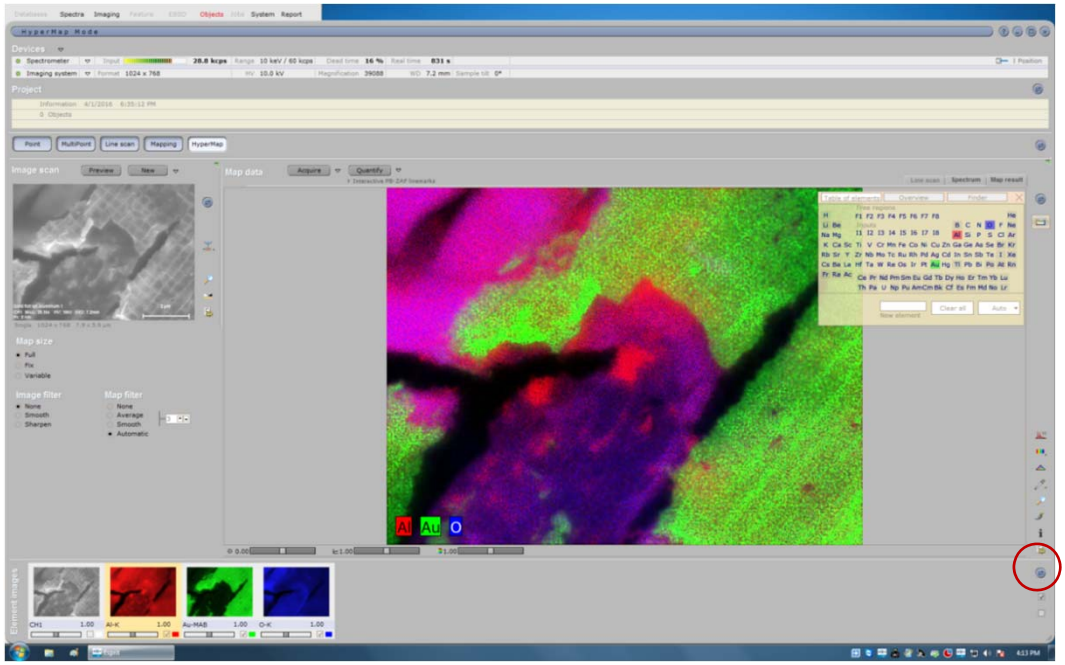
Under Map data click on Save . . .

1. Make sure the directory is yours
2. The file type is an image file (e.g. .jpeg)
3. Give the file a name
4. Click on Save

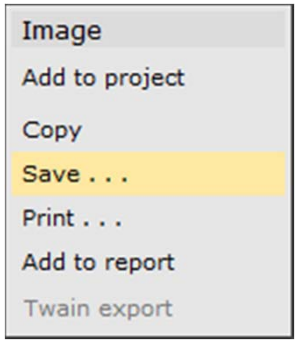
10.00

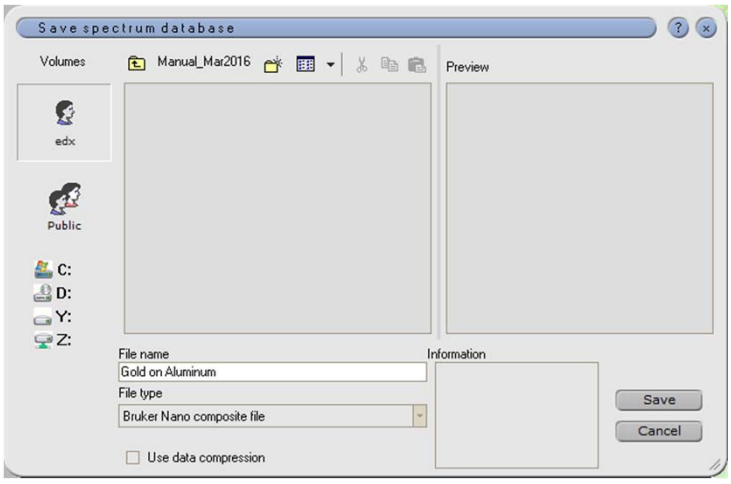
Step 3 – saving data (continued):

Saving the individual images: Click on the icon as shown.



Under Image click on Save . . .



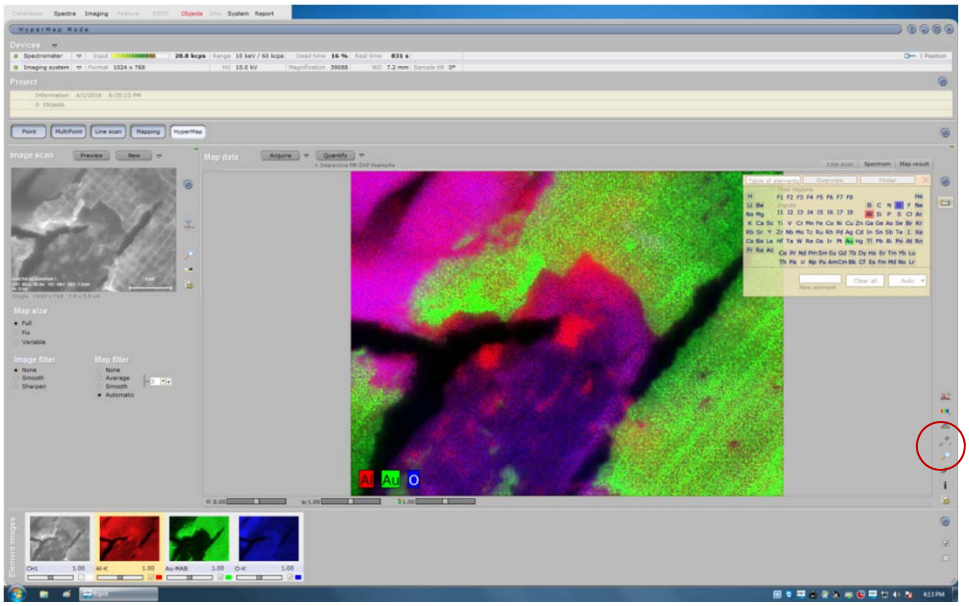


1. Make sure the directory is yours
2. The file type is an image file (e.g. .jpeg)
3. Give the file a name
4. Click on Save

10.00

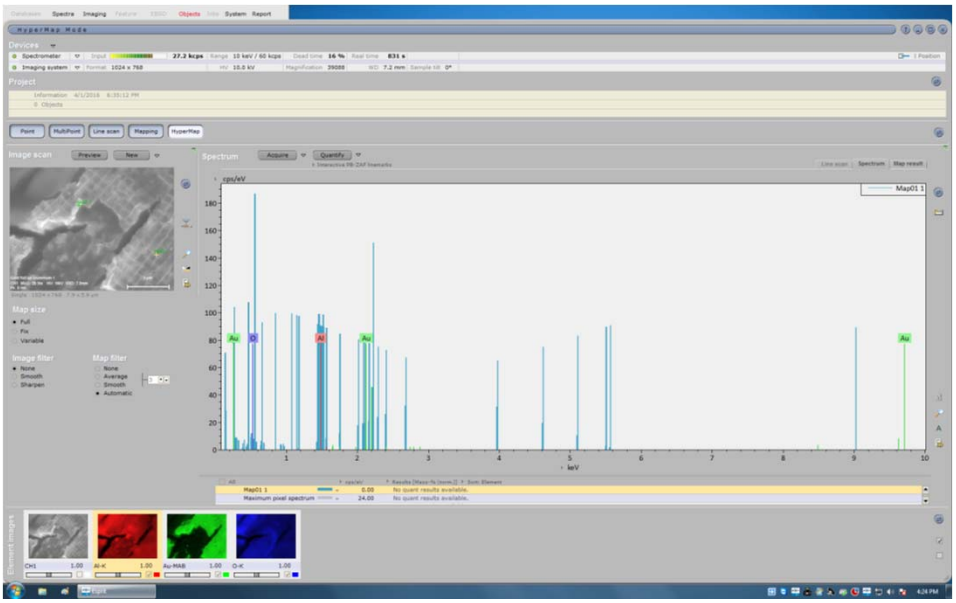
Step 4 - quatification:

Right click on the eyedropper icon on the lower right hand side



Select the area you want to analyze.

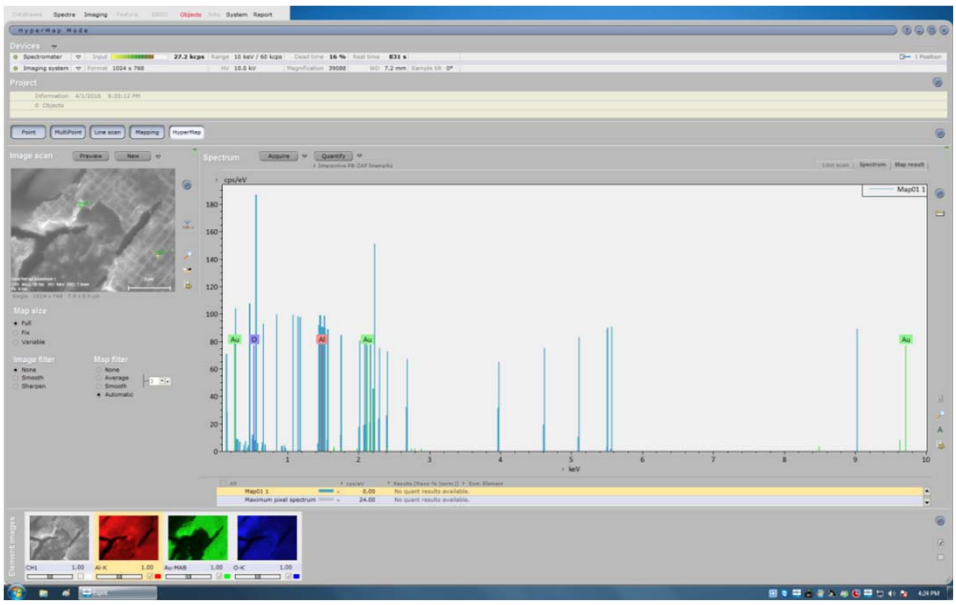
The spectra will appear as shown



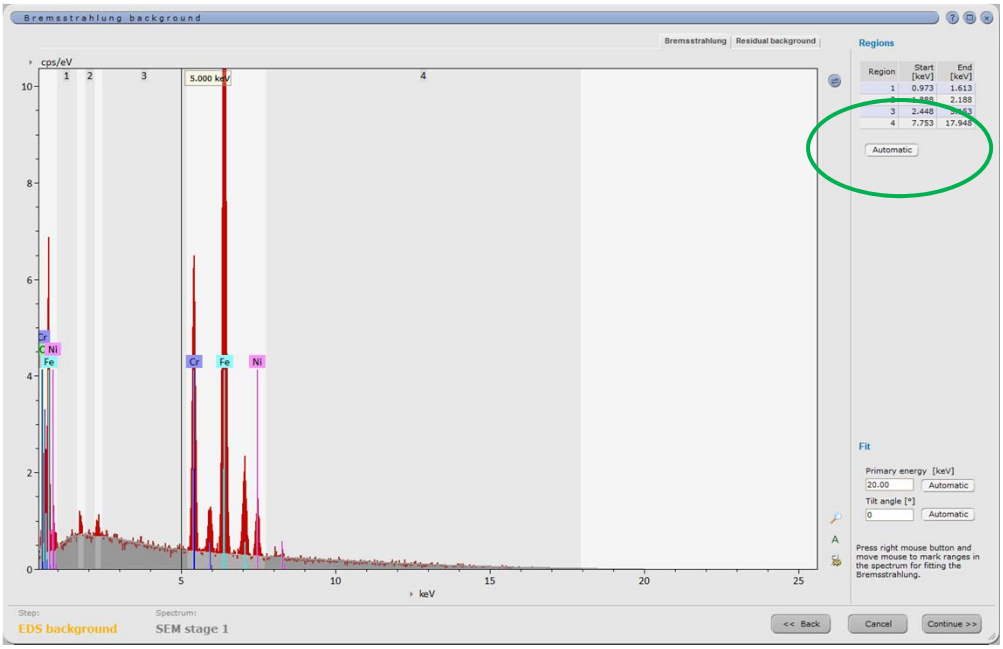
10.00

Step 4 - quantification:

To quantify the elements choose a spectra and click on Quantify



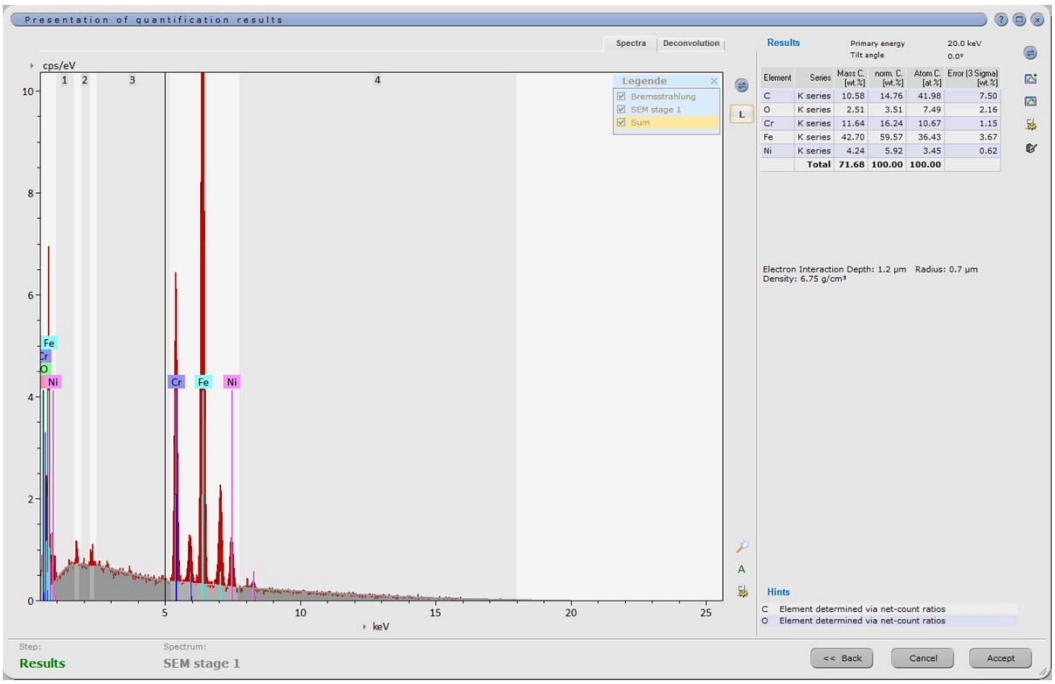
Click on Automatic



10.00

Step 4 – quantification (continued):

Note a result table has showed up in the corner:



Click on 

Results Primary energy 20.0 keV; Tilt angle 0.0°

Element	Series	Mass C. [wt.%]	norm. C. [wt.%]	Atom C. [at.%]	Error (3 Sigma) [wt.%]
C	K series	10.58	14.76	41.98	7.50
O	K series	2.51	3.51	7.49	2.16
Cr	K series	11.64	16.24	10.67	1.15
Fe	K series	42.70	59.57	36.43	3.67
Ni	K series	4.24	5.92	3.45	0.62
	Total	**71.68**	**100.00**	**100.00**	

Electron Interaction Depth: 1.2 µm Radius: 0.7 µm
Density: 6.75 g/cm³

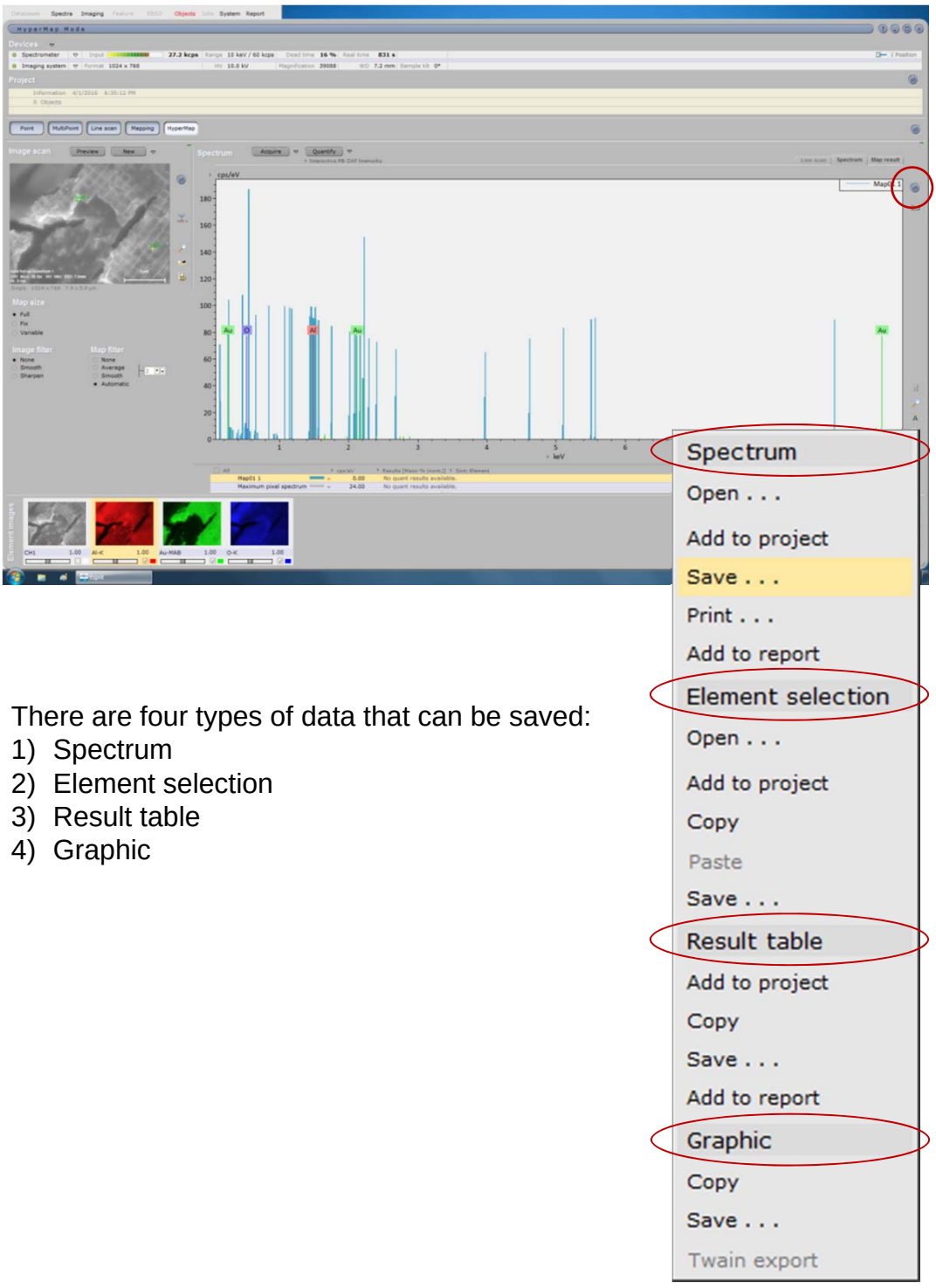
The software displays the results in several ways.

Note also that the electron interaction depth and radius are provided.

10.00

Step 5 – saving data:

Click on the icon as shown.



There are four types of data that can be saved:

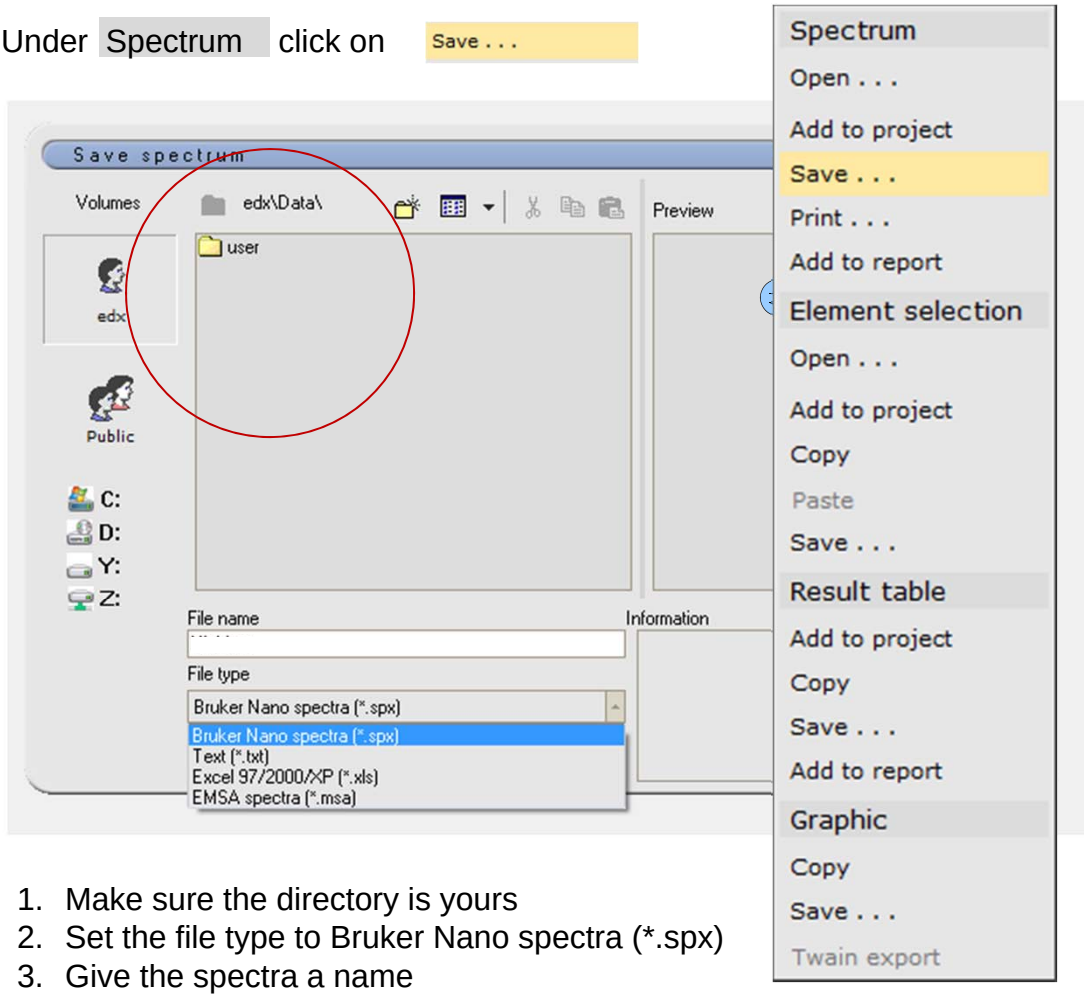
1) Spectrum
2) Element selection
3) Result table
4) Graphic

X-ray mapping

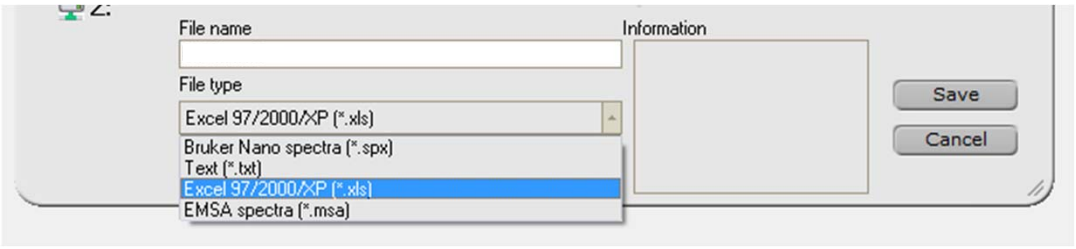
Step 5 – saving the data (continued):

Saving the spectra:

Under Spectrum click on Save . . .



1. Make sure the directory is yours
2. Set the file type to Bruker Nano spectra (*.spx)
3. Give the spectra a name
4. Click on Save



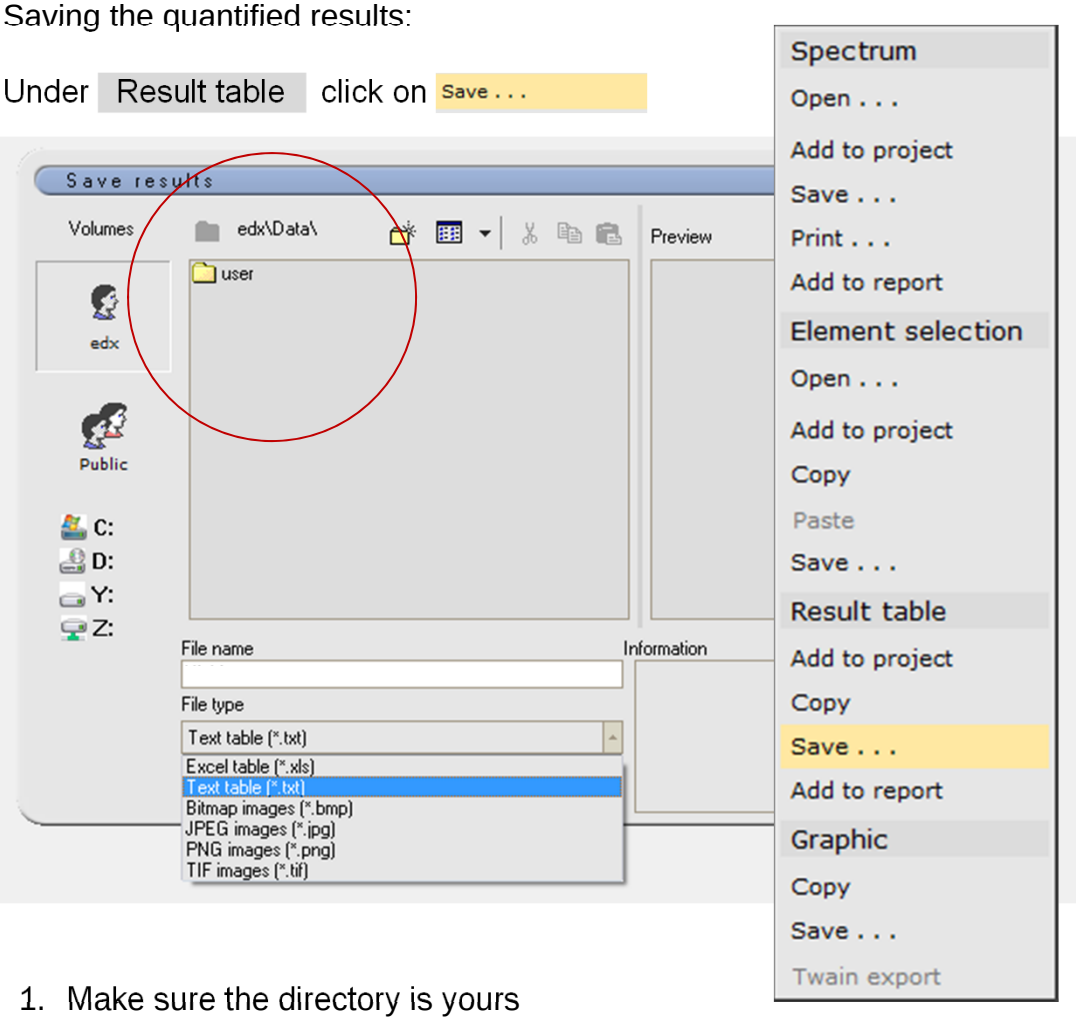
5. Under Spectrum click on Save . . . again
6. Set the file type to Excel 97/2000/XP (*.xls)
7. The same file name should populate the File name box
8. Click on Save

10.00

Step 5 – saving the data (continued):

Saving the quantified results:

Under Result table click on Save . . .



1. Make sure the directory is yours
2. Set to Text table (*.txt)
3. The same file name should populate the box with a .txt extension
4. Click on Save

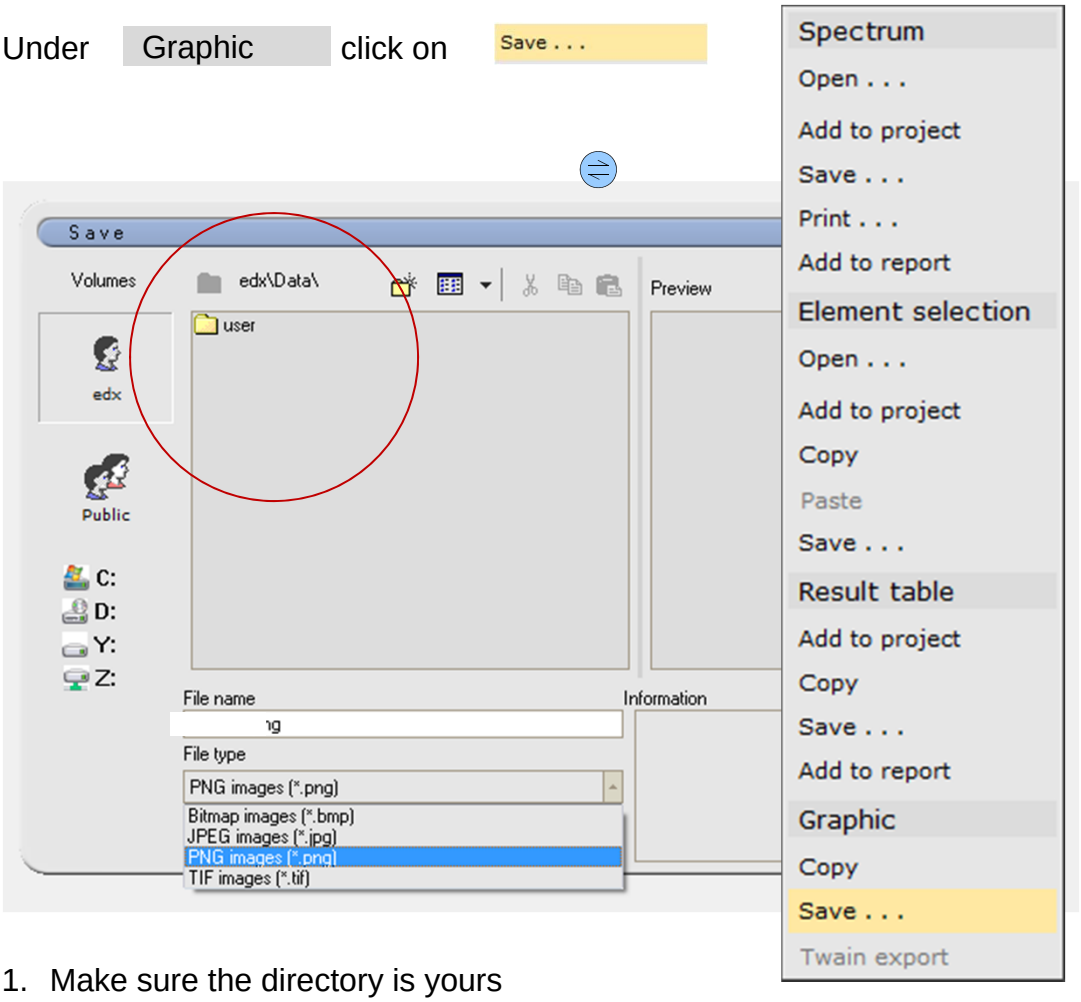
10.00

Step 5 - saving the data (continued):

Saving images of spectra:

Important!! Saving an image of the spectra does NOT save the raw data!!!
Image files CANNOT be quantitatively analyzed!!

Under Graphic click on Save . . .



1. Make sure the directory is yours
2. Set to the file type you want (e.g. .png)
3. Type in the same filename as for your data files
4. Click on Save