

EDS Training Notebook

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October 24, 2018 (rev. 1.0)

Before you begin...

- ❑ All EDS users **MUST** complete SEM training prior to access

SEM Operation

- I. Sample Preparation
- II. Initiate Software
- III. Sample Properties
- IV. Microscope
- V. Scan Configuration
- VI. EDS Configuration
- VII. Image Capture
- VIII. Spectrum Acquisition
- IX. Spectrum Quantification
- X. Spectrum Chart
- XI. Choice of BI
- XII. Choice of Acquire
- XIII. Choice of HV
- XIV. Object Analysis
- XV. Line Scan
- XVI. Mapping
- XVII. Mapping Processing
- XVIII. Cleanup
- XIX. QMap

I. Sample Preparation – 1/1

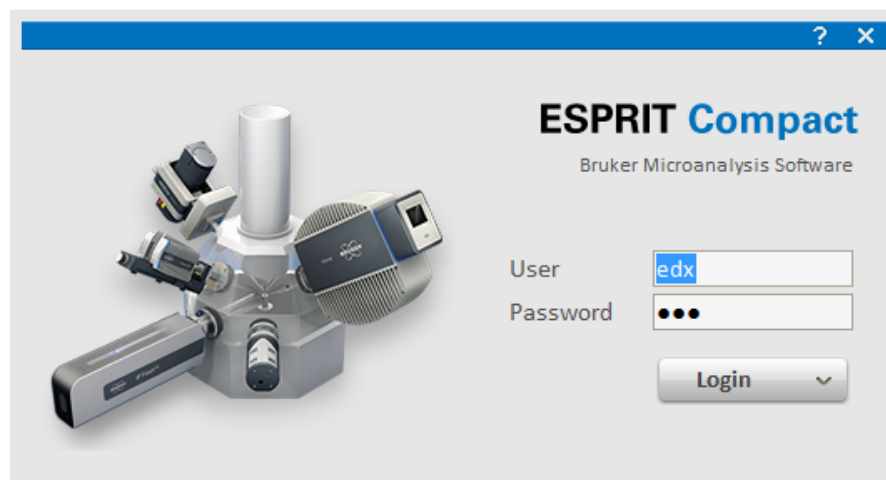
1. Prepare your sample normally for SEM imaging
2. Acquire any high magnification images **BEFORE** configuring for EDS

NOTE: SEM settings for acquiring high magnification images are **NOT** compatible with acquiring high quality EDS spectra!

3. Adjust the **HV** to appropriate value
 - Recommend starting **HV** value of **15 kV** (**ADJUST AS NECESSARY**)
4. Adjust the **BI** value to appropriate value
 - Recommend starting **BI** value of **15** (**ADJUST AS NECESSARY**)
5. Set the optimal **Working Distance** to **14 mm** (must be in **Resolution Mode**)
6. **TURN OFF** the **IR Camera!**

II. Initiate Software – 1/1

1. **Record** your time-in on the **sign-in sheet** located on preparation table (if you haven't already)
2. Double-click on **ESPRIT Compact** icon to load software on the **RIGHT (NOT LEFT)** monitor screen
3. Sign into your user account with your **Username** and **Password** or use the default student user account (edx/edx)



III. Sample Properties – 1/1

1. Click on **Sample** tab
2. Input **Name** (if desired)
3. Input **Description** (if desired)
4. Add new **User Defined Data** by clicking on “+” (if desired)
5. Select if **Sample Coating** was applied

1. **None** – if sample is not coated
2. **Coating with** – if sample is coated; select element of the coating material in the periodic table that pops up (selected element will be considered for peak deconvolution but will not be quantified)

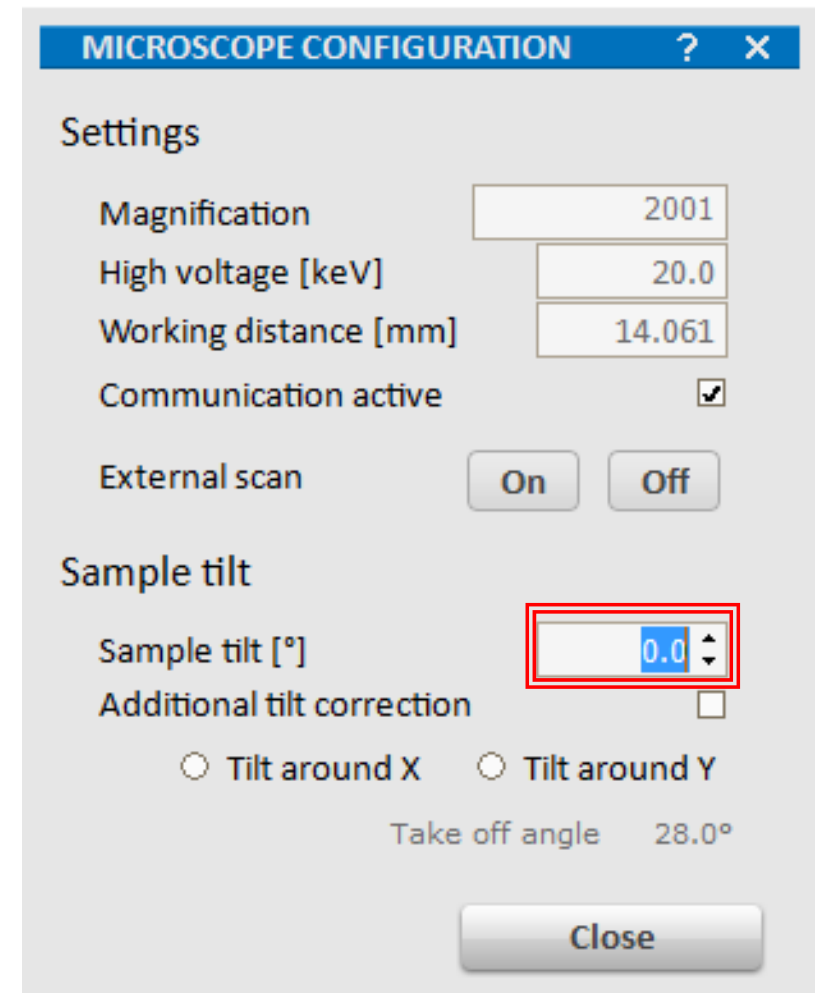
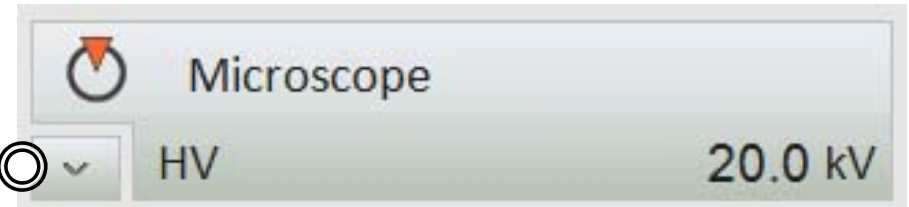
3. **Coating correction** – if sample is coated and a coating correction data file (.ccc) is available

The image shows a software interface for defining sample properties. At the top, there is a 'Sample' tab with a dropdown arrow. Below it is the 'SAMPLE PROPERTIES' dialog box. The dialog has a blue title bar with a question mark and a close button. It contains the following sections:


- Name**: A text input field with a blue arrow button to its right.
- Description**: A larger text input field.
- User defined data**: A section with a table header 'Name Value' and a '+' button to add new data.
- Sample coating**: A section with three radio buttons: 'None' (selected), 'Coating with', and 'Coating correction'.
- Buttons**: 'OK' and 'Cancel' buttons at the bottom right.

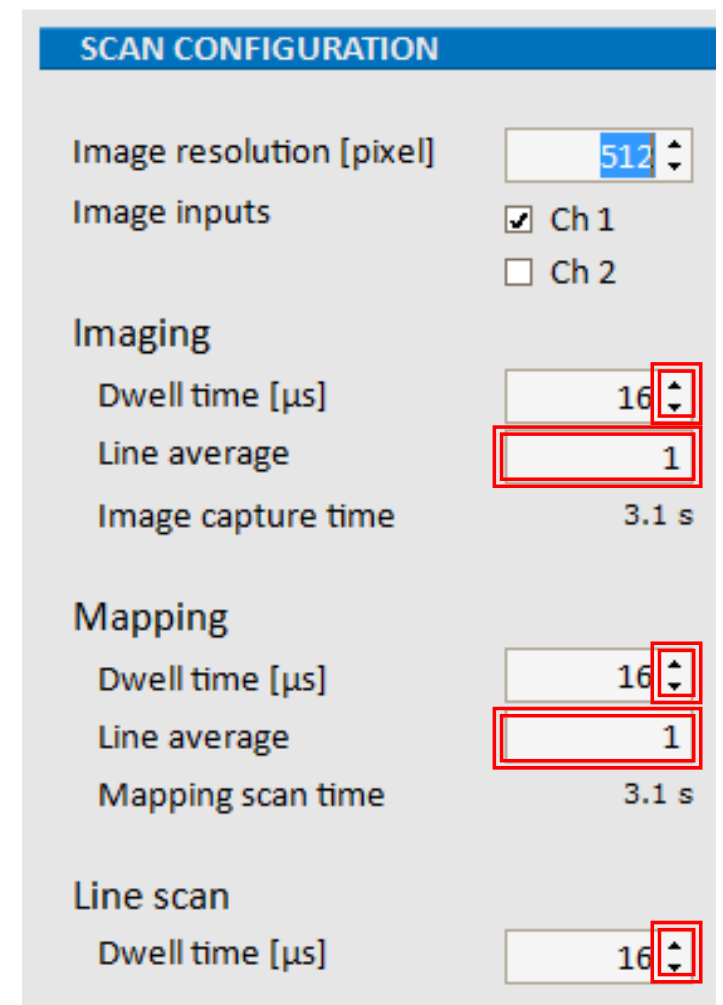
IV. Microscope – 1/1

1. Click on **Microscope** tab
2. Confirm that Communication active is checked ✓
3. If sample is tilted, enter in the value of the **Sample tilt** in degrees
4. Additional tilt correction – check this option if sample is tilted and no image tilt correction (used for large tilt angles)



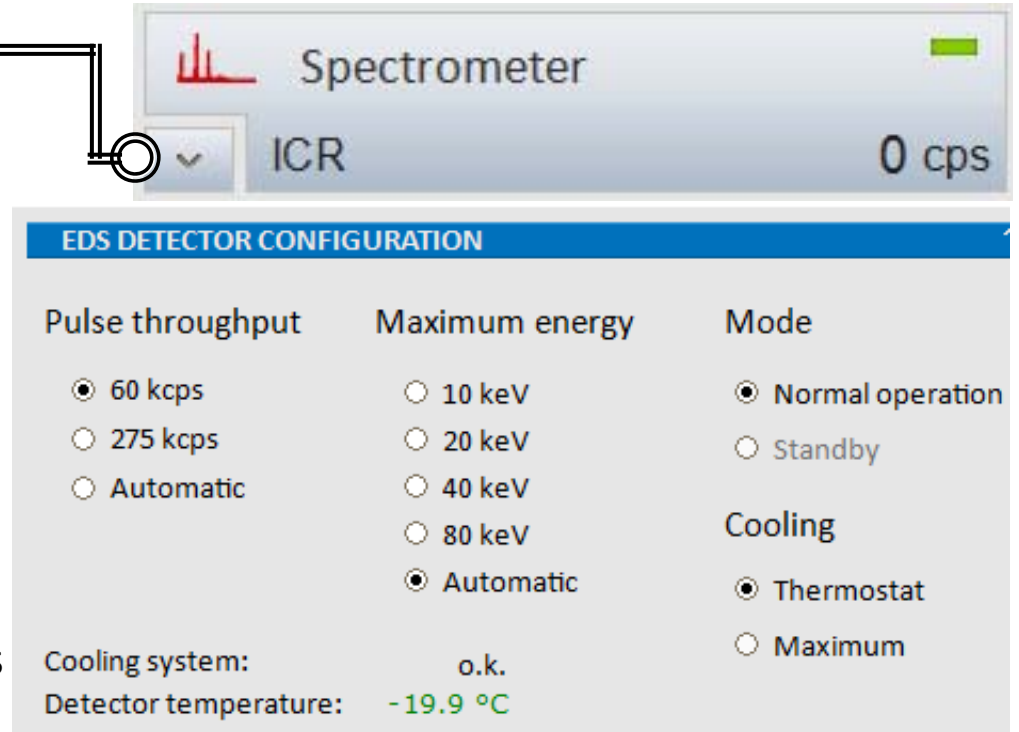
V. Scan Configuration – 1/1

1. Click on **Size** tab
2. Adjust **Image Resolution** as necessary for increased resolution (default = **512 pixels**)
3. Confirm that **Ch 1** is checked ✓
4. Choose appropriate **Imaging Dwell time**, **Mapping Dwell time**, and **Line Scan Dwell time** with the  (default = **16 μs**)
 - **Dwell time** = time the electron beam stays on a pixel while capturing an **image**, acquiring **EDS map**, or acquiring **EDS line scan**
5. Choose appropriate **Line average** factor (default = **1**)
 - Live average = controls number of times a horizontal line is scanned before proceeding to next line



VI. EDS Configuration – 1/1

1. Click on **ICR** tab
2. Identify desired **Pulse Throughput**
 - 60 kcps – ideal for peak separation or energy resolution (default)
 - 275 kcps – ideal for max x-ray signal detection + higher BI use



The screenshot shows the 'Spectrometer' software interface. At the top, there is a 'Spectrometer' window with a red histogram icon and a green status bar. Below it, a dropdown menu is open, showing 'ICR' selected. To the right, the count rate is displayed as '0 cps'. Below the dropdown is the 'EDS DETECTOR CONFIGURATION' panel. This panel has three columns: 'Pulse throughput', 'Maximum energy', and 'Mode'. Under 'Pulse throughput', '60 kcps' is selected with a radio button. Under 'Maximum energy', 'Automatic' is selected. Under 'Mode', 'Normal operation' is selected. Below these options, there are status indicators: 'Cooling system: o.k.' and 'Detector temperature: -19.9 °C'. A line from the text 'Click on ICR tab' points to the dropdown menu.

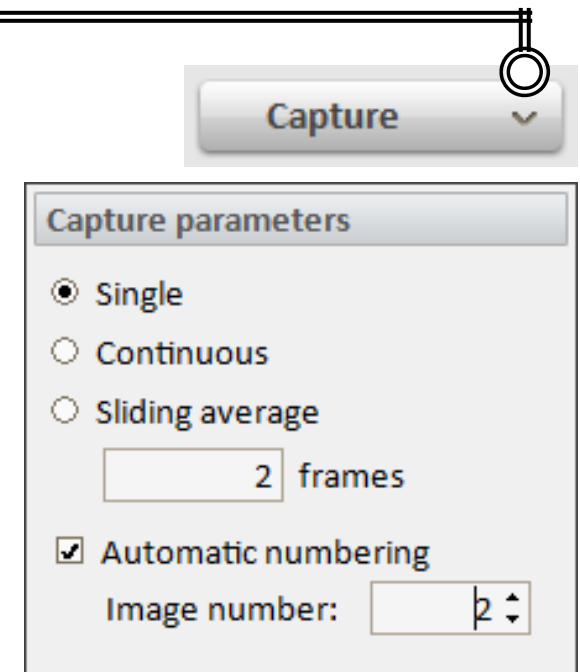
Pulse throughput	Maximum energy	Mode
<input checked="" type="radio"/> 60 kcps	<input type="radio"/> 10 keV	<input checked="" type="radio"/> Normal operation
<input type="radio"/> 275 kcps	<input type="radio"/> 20 keV	<input type="radio"/> Standby
<input type="radio"/> Automatic	<input type="radio"/> 40 keV	
	<input type="radio"/> 80 keV	
	<input checked="" type="radio"/> Automatic	

Cooling system: o.k.
Detector temperature: -19.9 °C

3. Identify appropriate **Maximum Energy** for 4096 channels
 - **Maximum Energy** value determines the width of an energy channel (i.e. energy resolution)
 - Automatic – sets **Maximum Energy** according to **HV value** (default)
 - $10 \text{ keV} = 2.4 \text{ eV/channel}$
 - $20 \text{ keV} = 4.8 \text{ eV/channel}$
 - $40 \text{ keV} = 9.8 \text{ eV/channel}$
 - $80 \text{ keV} = 19.5 \text{ eV/channel}$

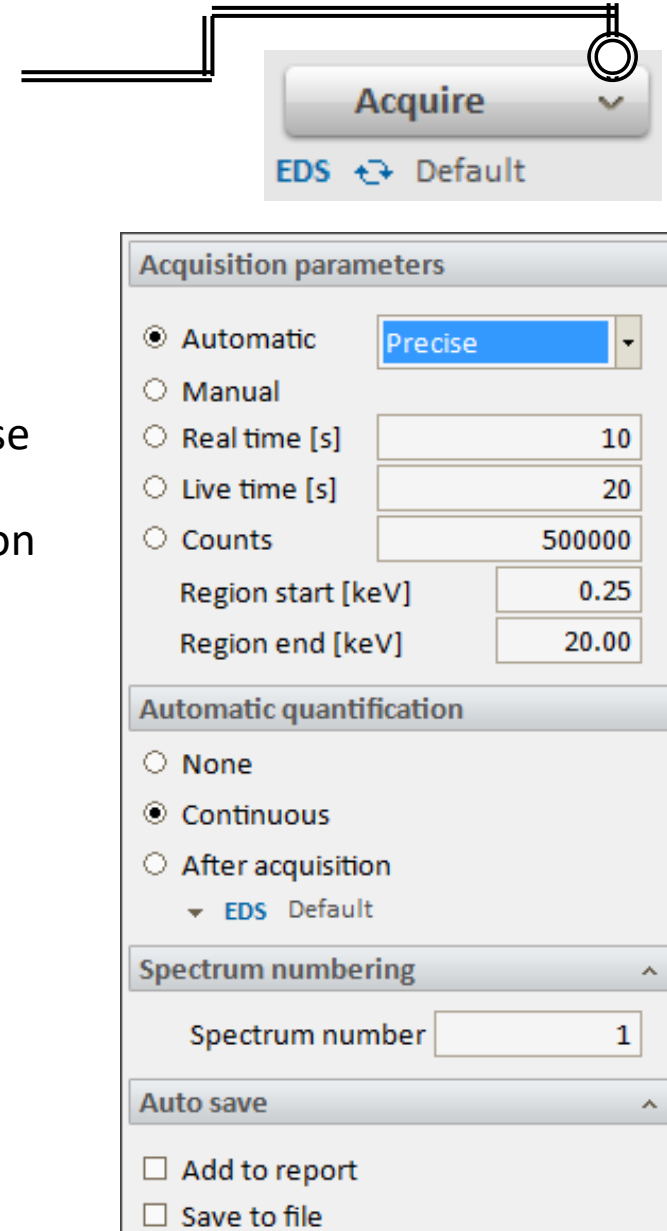
VII. Image Capture – 1/1

1. Click on the ∨ to identify the **Capture Parameters**
2. Identify the appropriate Image Capture Parameters (based on **IV. Scan Configuration**)
 - **Single** – captures one image frame (recommend)
 - **Continuous** – continuously updates image frame
 - **Sliding average** – averages # of frames
3. Identify if **Automatic numbering** is desired (default)
4. Identify **Image number**
 - Choose “1” as default for each new sample



VIII. Spectrum Acquisition – 1/1

1. Click on the ∇ to identify the **Acquire** Parameters
2. Identify the appropriate Acquisition parameters
 - **Automatic** – acquisition time based on counts
 - **Fast** = 50,000 counts for major elements
 - **Precise** = 250,000 counts for minor elements (recommended)
 - **Exhaustive** = 1,000,000 counts for elements close to the detection limit of instrument
 - **Manual** – stopped manually by clicking on **Stop** button
 - **Real time** – actual time on your watch
 - **Live time** – estimate of time acquiring counts
 - **Counts** – total number of counts accumulated
3. Identify if **Automatic quantification** is desired
 - **None** – no automatic quantification
 - **Continuous** – will continuously quantify during acquisition
 - **After acquisition** – only quantify after acquisition
4. Identify **Spectrum number**
 - Choose “1” as default for each new sample



The image shows a software interface for spectrum acquisition. At the top right, there is a button labeled "Acquire" with a downward-pointing arrow. Below it, the text "EDS" is followed by a circular refresh icon and the word "Default".

The main panel is titled "Acquisition parameters" and contains the following settings:

- Automatic**: A dropdown menu is set to "Precise".
- Manual**
- Real time [s]**: 10
- Live time [s]**: 20
- Counts**: 500000
- Region start [keV]**: 0.25
- Region end [keV]**: 20.00

Below this is the "Automatic quantification" section:

- None**
- Continuous**
- After acquisition**
- EDS Default

Next is the "Spectrum numbering" section:

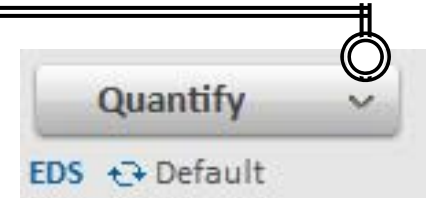
- Spectrum number**: 1

Finally, the "Auto save" section has two checkboxes:

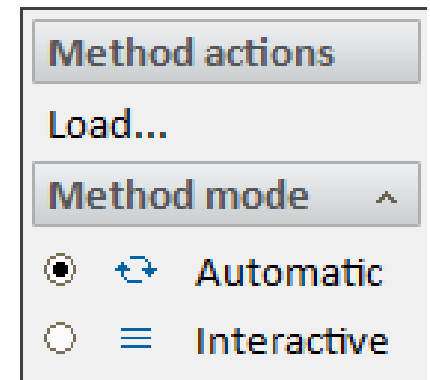
- Add to report**
- Save to file**

IX. Spectrum Quantification – 1/1

1. Click on the ∇ to identify the **Quantify** Parameters






2. Click on **Load...** to load pre-configured quantification method (Advanced Users only)



3. Choose the appropriate **Method Mode**
 - **Automatic** – quantification results automatically show up in spectrum list (default)
 - **Interactive** – quantification dialog pops up (recommended for complicated spectra)

X. Spectrum Chart – 1/2

- 1. *Spectrum Color*:** Click on the ∇ to select the color
- 2. *Options*:** Click on \triangleright to select pulses, cps, net counts, or energy resolution
- 3. *Results*:** Click on \triangleright to select spectrum information, identification or display of quantification results: mass-%, mass-% (norm.), atom-%, stoich.-%, or stoich.-% (norm)
- 4. *Spectra*:** Multiple spectra can be selected (checkbox) or select **All**
- 5. *Element ID*:** Multiple IDs can be shown by selecting spectrum line (hold Shift + left-click to select multiple IDs)
- 6.** To scale or zoom the spectrum diagram, use either:
 - Scroll mouse wheel to change x-scale
 - Click and hold mouse wheel up/down to change y-scale
 - Click and hold mouse wheel left/right to move spectrum area
 - Right-click on x- or y-axis to scale values manually
 - Right-click on spectrum and select Auto Scale for automatic scaling

<input checked="" type="checkbox"/> All			\triangleright cps/eV	\triangleright Real
<input checked="" type="checkbox"/> EDS	1		26.15	8.1 s
<input checked="" type="checkbox"/> EDS	2		0.92	6.9 s
<input checked="" type="checkbox"/> EDS	3		0.24	5.7 s

Callouts: 1 (mouse wheel), 2 (cps/eV), 3 (Real), 4 (checkbox), 5 (dropdown arrow)

X. Spectrum Chart – 2/2

7. Click on **Elements** icon to select or de-select elements in spectrum



8. Click **Clear all** button to remove all elements from spectrum

9. Click **Auto ID** to automatically identify elements from spectrum

10. Click **Finder** to see a list of possible elements based on cursor position

11. Add or delete elements by clicking on the element name

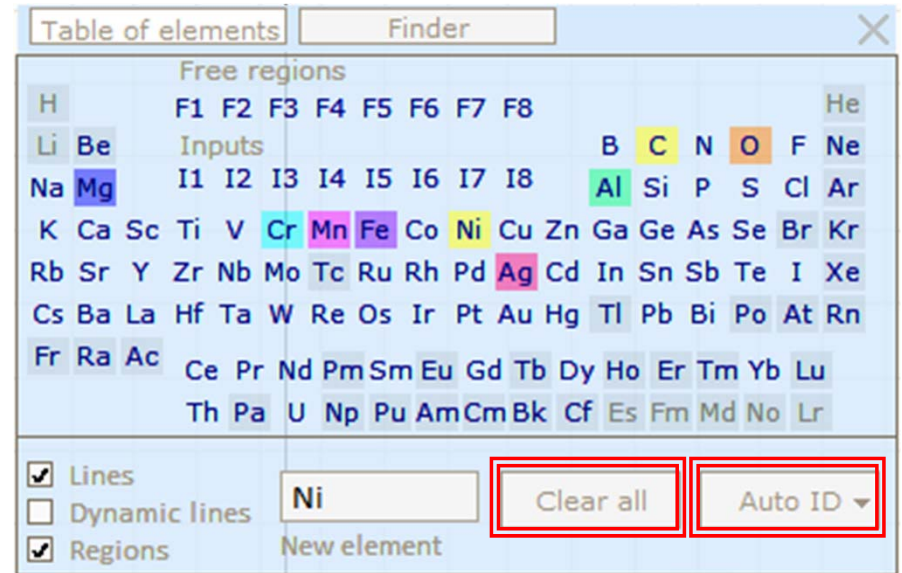
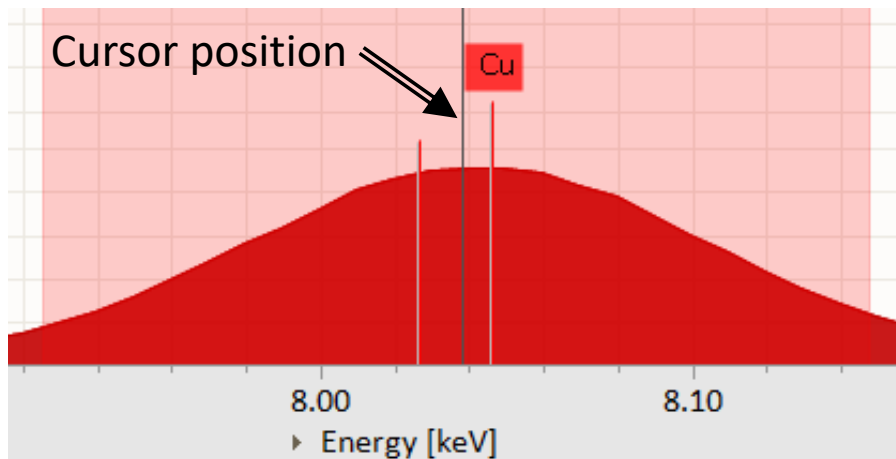


Table of elements Finder

Free regions

H	F1	F2	F3	F4	F5	F6	F7	F8	He								
Li	Be	Inputs						B	C	N	O	F	Ne				
Na	Mg	I1	I2	I3	I4	I5	I6	I7	I8	Al	Si	P	S	Cl	Ar		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Lines Dynamic lines Regions

Ni New element

Clear all Auto ID

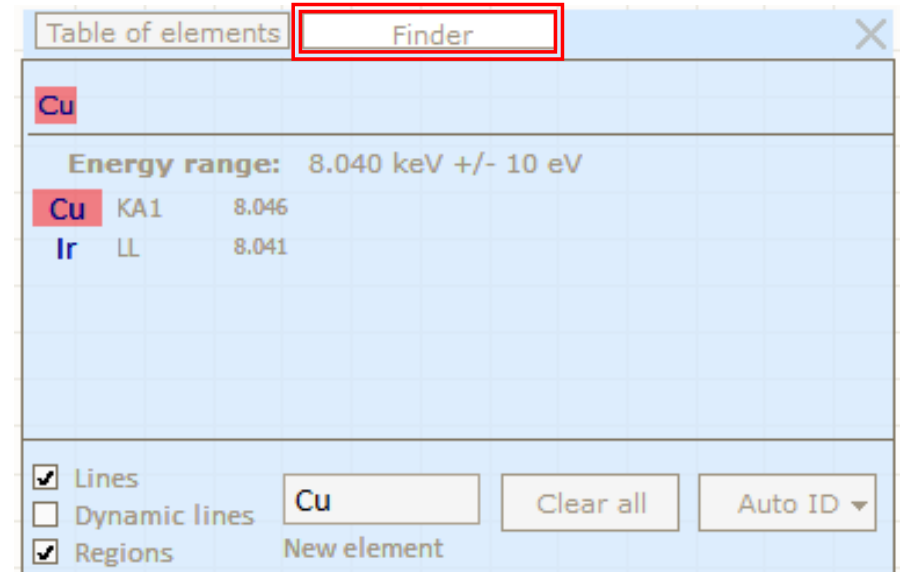


Table of elements Finder

Cu

Energy range: 8.040 keV +/- 10 eV

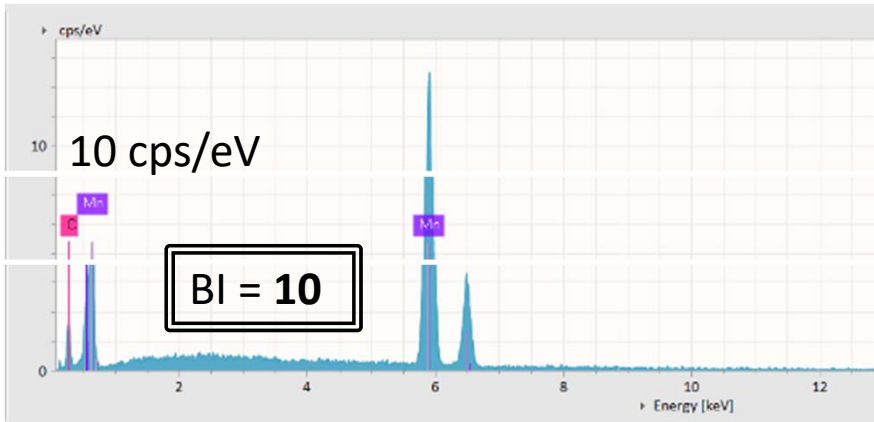
Cu	KA1	8.046
Ir	LL	8.041

Lines Dynamic lines Regions

Cu New element

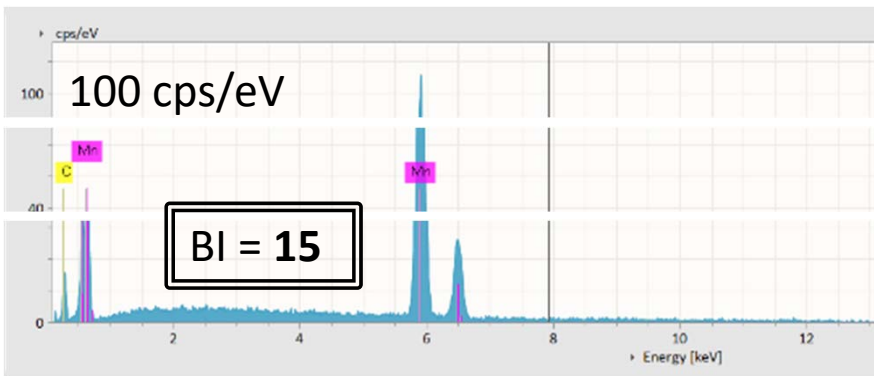
Clear all Auto ID

XI. Choice of BI – 1/1



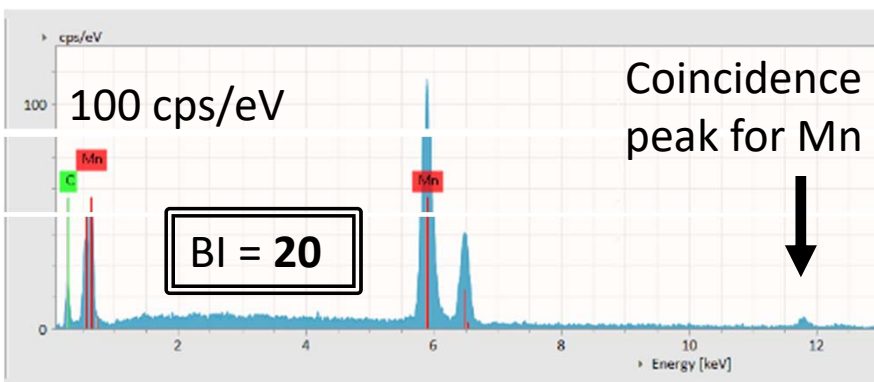
- Low total counts: ≤ 10 kcps (**bad**)
- Low Dead Time: 0 – 20% (**good**)
- Coincidence peaks: None (**good**)

cps/eV	Real	Live	Dead	Pulses	Input	Output
0.07	14 s	14 s	2 %	64177	3543 cps	3477 cps



- High total counts: ≥ 10 kcps (**good**)
- Moderate Dead Time: 20 – 30% (**good**)
- Coincidence peaks: None (**good**)

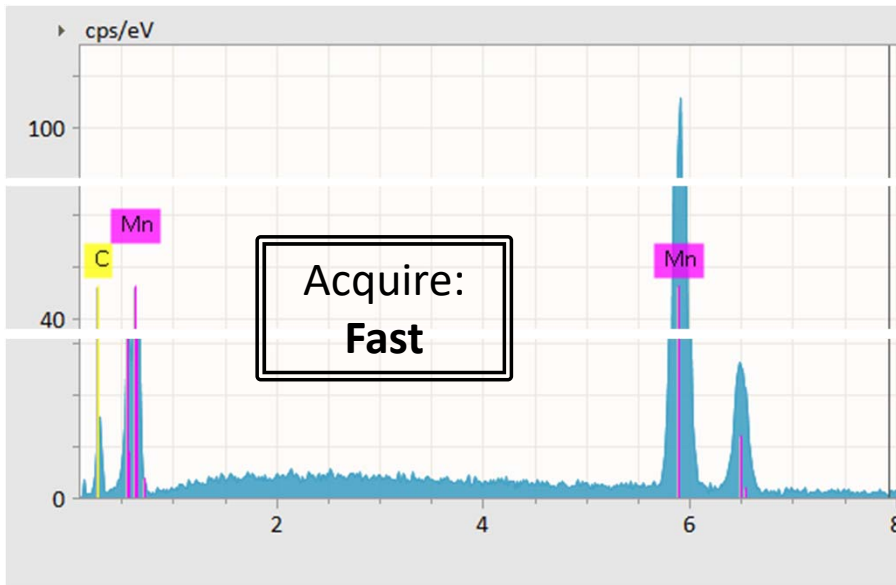
cps/eV	Real	Live	Dead	Pulses	Input	Output
0.51	1.6 s	1.2 s	22 %	59400	41.1 kcps	32.2 kcps



- High total counts: ≥ 10 kcps (**good**)
- High Dead Time: $\geq 30\%$ (**bad**)
- Coincidence peaks: Present (**bad**)

cps/eV	Real	Live	Dead	Pulses	Input	Output
0.99	1.4 s	0.1 s	91 %	56518	388.1 kcps	35.4 kcps

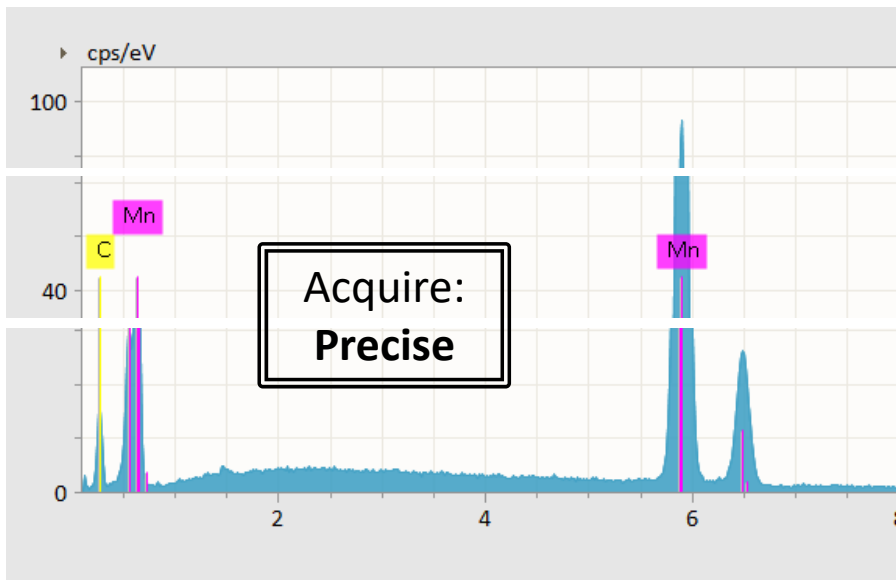
XII. Choice of Acquire – 1/1



Automatic – **Fast: 50,000 counts**

- Fast spectra collection
 - “Noisy” curves and peaks

cps/eV	Real	Live	Dead	Pulses	Input	Output
0.51	1.6 s	1.2 s	22 %	59400	41.1 kcps	32.2 kcps



Automatic – **Precise: 100,000 counts**

- Precise spectra collection
 - “Smoother” curves and peaks

cps/eV	Real	Live	Dead	Pulses	Input	Output
0.45	8.0 s	6.3 s	21 %	298549	39.9 kcps	31.4 kcps

XIII. Choice of HV – 1/3

Number	79	Gold	Name
Atomic mass	196.97 18.88	Au	Symbol
Density (kg/m ³)	L α 9.712 M 2.120		Characteristic X-ray (keV)

Minimum accelerating voltage or **HV** should be chosen based on:

- Element(s) used for analysis
- Characteristic X-ray(s) of element(s)

Note: Density
 * 'C' as (graphite), 'P' as (white),
 'S' as (alpha), 'Sn' as (white)

Minimum accelerating voltage

Example: Mn

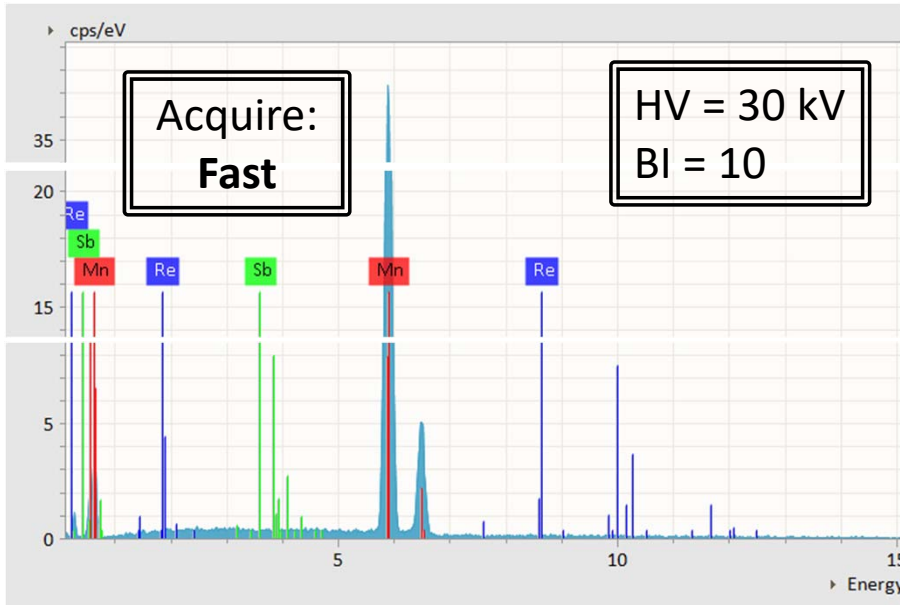
$K\alpha = 5.894$ keV requires 10 kV or higher

$L\alpha = 0.637$ keV requires 5 kV or higher

Hydrogen 1 H 1.01 0.08	Unable to detect																Helium 2 He 4.00 0.19							
Lithium 3 Li 6.94 0.53	Beryllium 4 Be 9.01 1.85 K α 0.110	5kV or higher																						
Sodium 11 Na 22.99 0.97 K α 1.041	Magnesium 12 Mg 24.31 1.74 K α 1.253	10kV or higher																Aluminium 13 Al 26.98 2.70 K α 1.486	Silicon 14 Si 28.09 2.42 K α 1.739	Phosphorus 15 P 30.97 2.02 K α 2.013	Sulphur 16 S 32.06 2.07 K α 2.307	Chlorine 17 Cl 35.45 2.2 K α 2.621	Argon 18 Ar 39.95 1.65 K α 2.957	Neon 10 Ne 20.18 1.20 K α 0.848
Potassium 19 K 39.10 0.87 K α 3.312	Calcium 20 Ca 40.08 1.55 K α 3.690	Scandium 21 Sc 44.96 2.99 K α 4.088 L α 0.395	Titanium 22 Ti 47.88 4.5 K α 4.508 L α 0.452	Vanadium 23 V 50.94 5.87 K α 4.949 L α 0.511	Chromium 24 Cr 52.00 7.14 K α 5.411 L α 0.573	Manganese 25 Mn 54.94 7.3 K α 5.894 L α 0.637	Iron 26 Fe 55.85 7.86 K α 6.398 L α 0.705	Cobalt 27 Co 58.93 8.71 K α 6.924 L α 0.776	Nickel 28 Ni 58.70 8.8 K α 7.471 L α 0.851	Copper 29 Cu 63.55 8.93 K α 8.040 L α 0.930	Zinc 30 Zn 65.38 6.92 K α 8.630 L α 1.012	Gallium 31 Ga 69.72 5.93 K α 9.241 L α 1.098	Germanium 32 Ge 72.59 5.46 K α 9.874 L α 1.188	Arsenic 33 As 74.92 5.73 K α 10.530 L α 1.282	Selenium 34 Se 78.96 4.82 K α 11.207 L α 1.379	Bromine 35 Br 79.90 4.2 K α 11.907 L α 1.480	Krypton 36 Kr 83.60 3.4 K α 12.631 L α 1.586							
Rubidium 37 Rb 85.47 1.53 K α 13.373 L α 1.694	Strontium 38 Sr 87.62 2.60 K α 14.140 L α 1.806	Yttrium 39 Y 88.91 13.3 K α 14.931 L α 2.042	Zirconium 40 Zr 91.22 6.44 K α 15.744 L α 2.166	Niobium 41 Nb 92.91 9.01 K α 16.581 L α 2.166	Molybdenum 42 Mo 95.94 10.1 K α 17.441 L α 2.293	Technetium 43 Tc (97) 98.906 10.2 K α 18.325 L α 2.424	Ruthenium 44 Ru 101.07 12.1 K α 19.233 L α 2.558	Rhodium 45 Rh 102.91 12.44 K α 2.696	Palladium 46 Pd 106.4 10.49 L α 2.838	Silver 47 Ag 107.87 10.49 L α 2.984	Cadmium 48 Cd 112.40 8.65 L α 3.133	Indium 49 In 114.82 7.28 K α 3.286 M 0.368	Tin 50 Sn 118.69 7.26 L α 3.443 M 0.691	Antimony 51 Sb 121.75 6.42 L α 3.604 M 0.733	Tellurium 52 Te 127.60 6.25 L α 3.769 M 0.778	Iodine 53 I 126.90 4.94 L α 3.937	Xenon 54 Xe 131.30 5.4 L α 4.109							
Cesium 55 Cs 132.91 1.87 L α 4.286	Barium 56 Ba 137.34 3.5 M 0.972	Lanthanoid 57-71	Hafnium 72 Hf 178.49 13.3 L α 7.898 L α 1.644	Tantalum 73 Ta 180.95 16.6 L α 8.145 M 1.709	Tungsten 74 W 183.85 19.3 M 1.774	Rhenium 75 Re 186.21 20.53 M 1.842	Osmium 76 Os 192.22 22.5 M 1.914	Iridium 77 Ir 192.22 22.42 M 1.977	Platinum 78 Pt 195.09 21.37 M 2.048	Gold 79 Au 196.97 18.88 M 2.120	Mercury 80 Hg 200.59 14.19 M 2.195	Thallium 81 Tl 204.37 11.86 L α 10.267 M 2.267	Lead 82 Pb 207.2 11.34 M 2.342	Bismuth 83 Bi 208.98 9.78 L α 10.837 M 2.419	Polonium 84 Po (209)	Astatine 85 At (210)	Radon 86 Rn (222)							
Francium 87 Fr (223)	Radium 88 Ra 226.03 10.97 L α 12.340	Actinoid 89-103	Lanthanum 57 La 138.91 6.17 L α 4.650 M 0.833	Cerium 58 Ce 140.12 6.64 L α 4.839 M 0.883	Praseodymium 59 Pr 140.91 6.77 L α 5.033 M 0.929	Neodymium 60 Nd 144.24 7.02 L α 5.229 M 0.978	Promethium 61 Pm (145)	Samarium 62 Sm 150.4 7.54 L α 5.635 M 1.081	Europium 63 Eu 151.96 5.25 L α 5.845 M 1.131	Gadolinium 64 Gd 157.25 7.90 L α 6.056 M 1.185	Terbium 65 Tb 158.93 8.25 L α 6.272 M 1.240	Dysprosium 66 Dy 162.50 9.56 L α 6.494 M 1.293	Holmium 67 Ho 164.93 8.80 L α 6.719 M 1.347	Erbium 68 Er 167.26 9.06 L α 6.947 M 1.405	Thulium 69 Tm 168.93 9.32 L α 7.179 M 1.462	Ytterbium 70 Yb 173.04 6.96 L α 7.414 M 1.521	Lutetium 71 Lu 174.97 9.84 L α 7.654 M 1.581							
Actinium 89 Ac (227)	Thorium 90 Th 232.04 11.09 L α 12.967 M 2.991	Protactinium 91 Pa 231.04 15.09 M 3.077	Uranium 92 U 238.03 18.7 L α 13.612 M 3.164	Neptunium 93 Np 237.05 19.7 L α 13.942 M 3.260	Plutonium 94 Pu (244)	Americium 95 Am (243)	Curium 96 Cm (247)	Berkelium 97 Bk (247)	Californium 98 Cf (251)	Einsteinium 99 Es (254)	Fermium 100 Fm (257)	Mendelevium 101 Md (258)	Nobelium 102 No (259)	Lawrencium 103 Lr (262)										

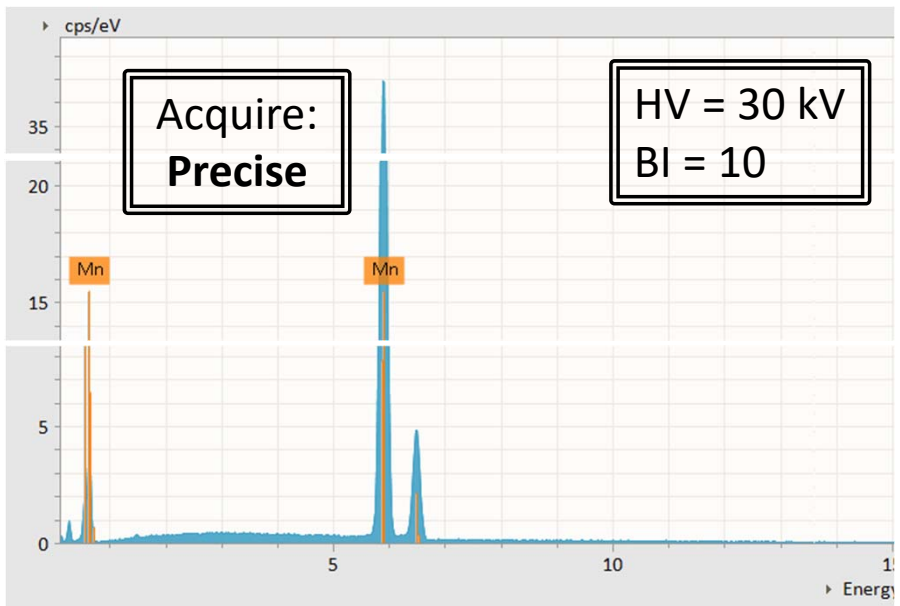
The colors mean to detect the characteristic X-ray of the lowest energy for each element.

XIII. Choice of HV – 2/3



Increasing HV does not always automatically get you better spectra! Check other settings!

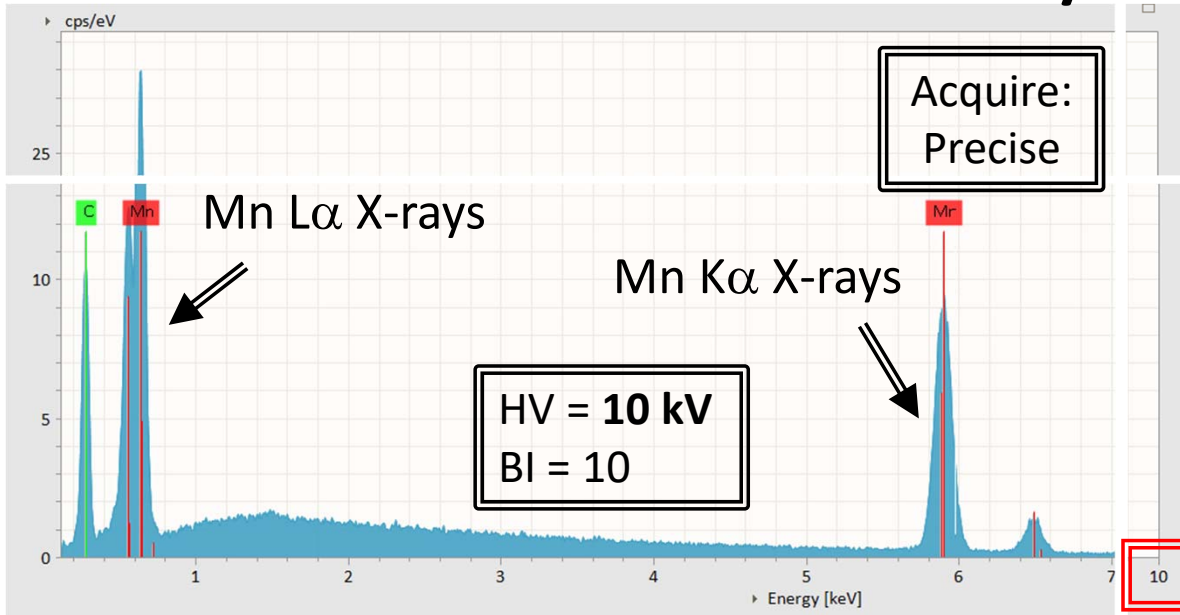
- Automatic – **Fast: 50,000 counts**
- Fast spectra collection
 - “Noisy” curves and peaks
 - May lead to false ID of peaks



User needs to check if enough counts are present to provide statistical representation of “real” peaks

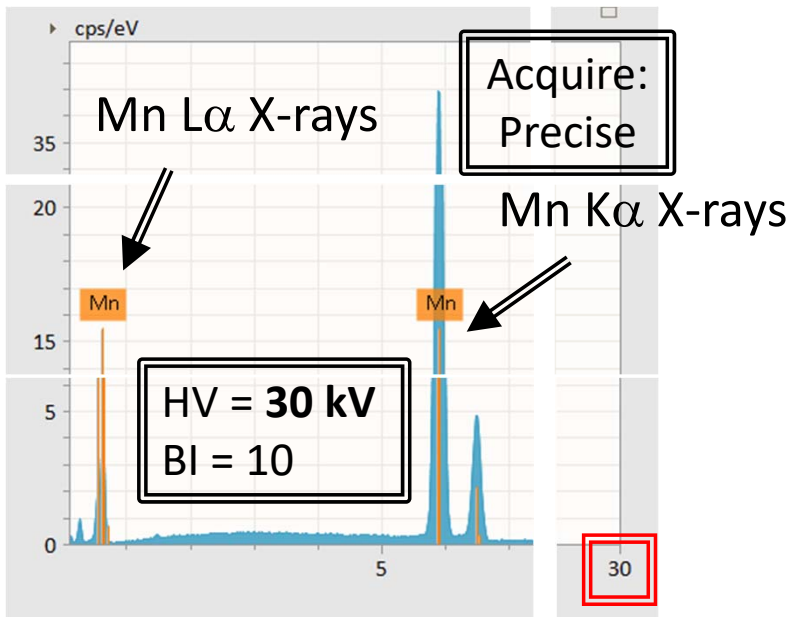
- Automatic – **Precise: 100,000 counts**
- Precise spectra collection
 - “Smoother” curves and peaks

XIII. Choice of HV – 3/3



HV = 10 kV

- Energy Range up to 10 keV
- Not all Mn $K\alpha = 5.894$ keV X-rays are generated by the 10 kV HV
- Mn $L\alpha = 0.637$ keV X-rays are easily generated by the 10 kV HV (higher counts)

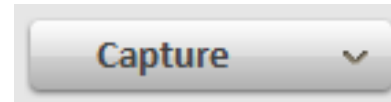


HV = 30 kV

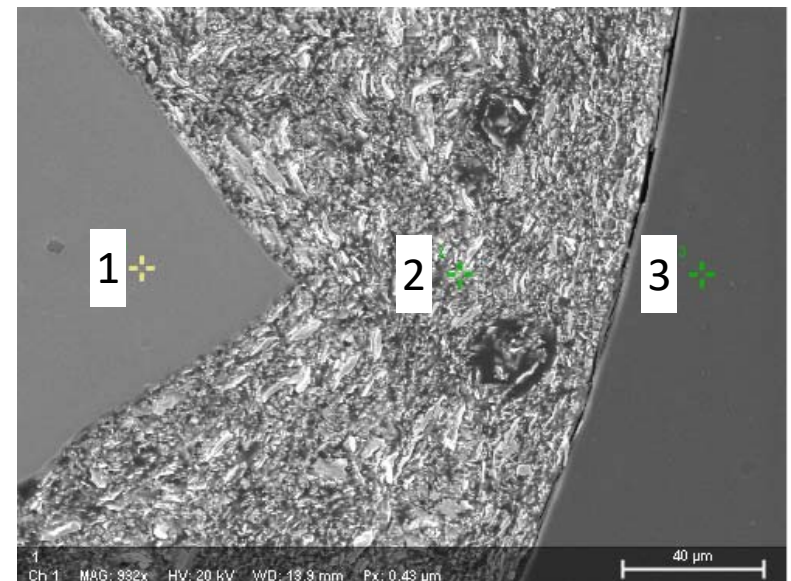
- Energy Range up to 30 keV
 - Unnecessary reduction in resolution
- Mn $K\alpha = 5.894$ keV X-rays are now easily produced by the 30 kV HV
- Mn $L\alpha = 0.637$ keV X-rays are now absorbed by sample (drop in counts)

XIV. Object Analysis – 1/1

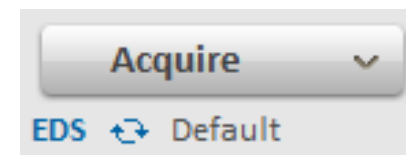
1. Click on **Objects** icon for Object Analysis
2. Click **Capture** to capture desired image
3. Select the desired object type: **point**, **rectangle**, **ellipse**, and **polygon**



4. Draw an object in the captured image
5. Use **Select all** button to highlight all objects



6. Click **Acquire** to acquire spectrum for selected objects






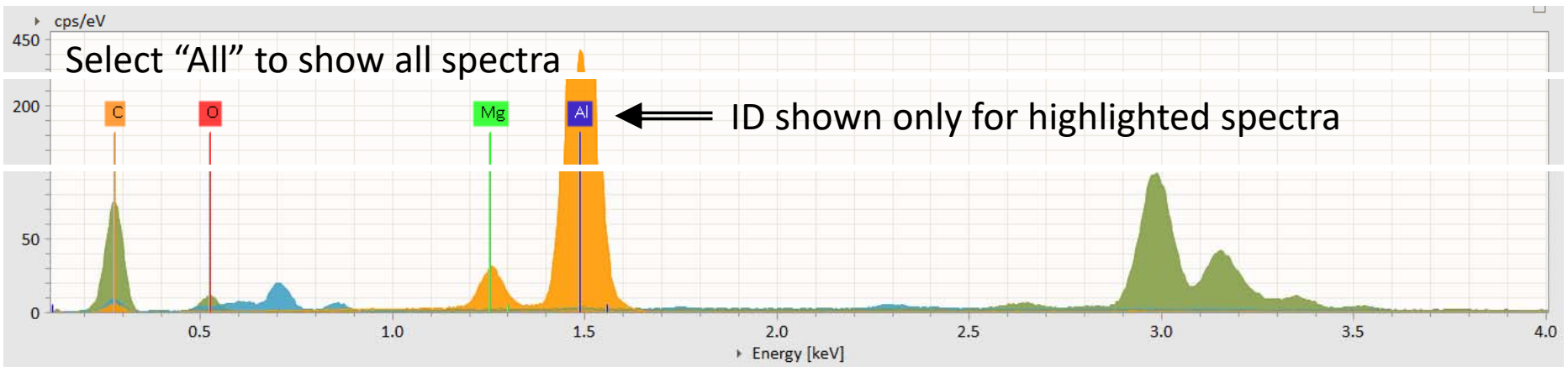
7. Click **Quantify** to quantify spectrum if not set to automatic quantification



XIV. Object Analysis – 1/2

8. Choose desired spectra or highlight element ID to display using chart below

<input checked="" type="checkbox"/> All	cps/eV			Results [Mass-%(norm.)]						Sort: Value
<input checked="" type="checkbox"/> EDS	1		1.81	Fe 55.15	Cr 16.26	C 14.77	Ni 10.32	Mo 1.98	Mn 1.17	Si 0.35
<input checked="" type="checkbox"/> EDS	2		1.37	Ag 57.89	C 28.62	O 13.28	Al 0.21			
<input checked="" type="checkbox"/> EDS	3		0.51	Al 73.95	C 22.15	Mg 3.33	O 0.57			



9. Click **Input/Output** icon to save or load data

- Use *.rto file format as it contains all available SEM images including objects and corresponding spectra

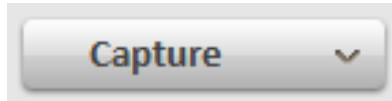


XV. Line Scan – 1/2

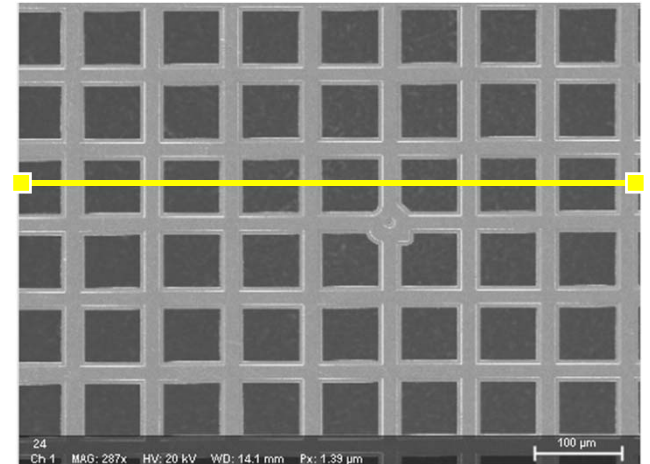
1. Click on **Line Scan** icon for Line Scan



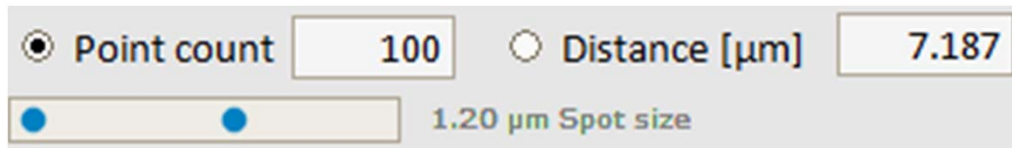
2. Click **Capture** to capture desired image



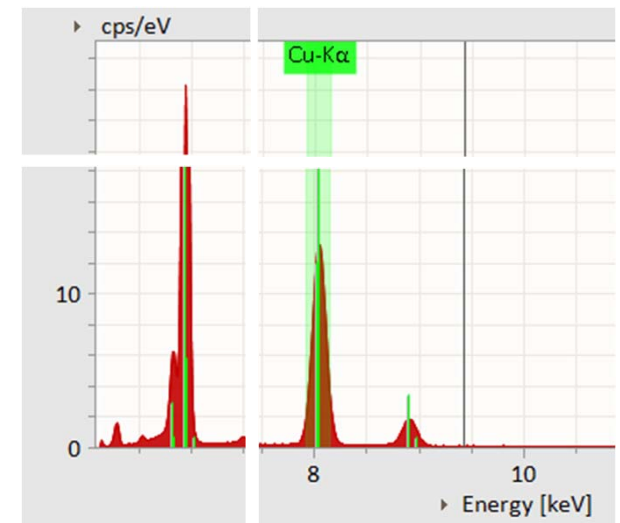
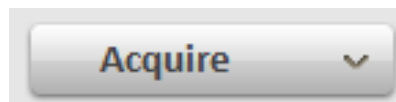
3. Highlight the line and drag and adjust the endpoints to desired position



4. Set the **Point count** or **Distance** between points of the line scan



5. Click **Acquire** to acquire a spectrum for drawn line

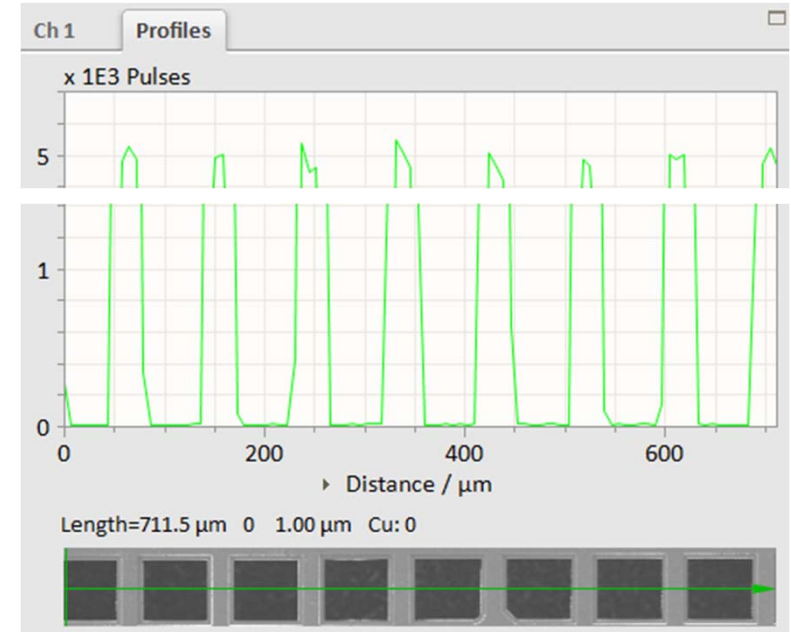


XV. Line Scan – 2/2

6. Click to view **Profiles** or **Spectrum** tab on upper right



7. Click **Quantify** to quantify spectrum



<input checked="" type="checkbox"/> All	▸ cps/eV	▸ Results [Mass-%(norm.)]	▸ Sort: Value
✓ EDS	Scan ██████████ ▾	0.01	Cu 100.00

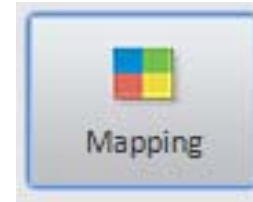
8. Click **Input/Output** icon to save or load data

- Use *.rtl file format to save line scan data including SEM and scan images and point spectra

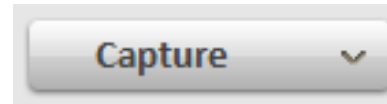


- **NOTE:** Esprit 2.1 will **NOT** allow further quantification on *.rtl files, recommend Mapping for future quantification analysis

XVI. Mapping – 1/2



1. Click on **Mapping** icon for Mapping Analysis
2. Click **Capture** to capture desired image
3. Click on the \vee to identify the **Acquire** Parameters for:

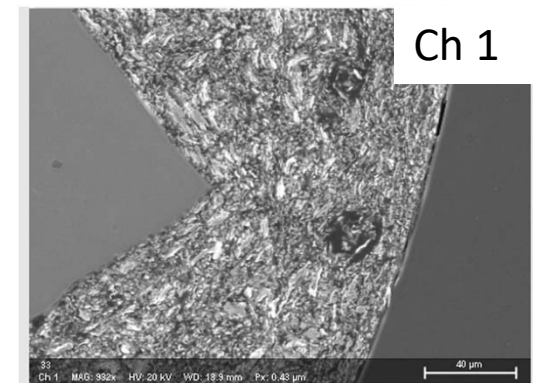
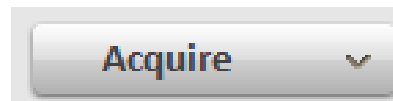


- Map time
 - **Manual** – stopped manually by clicking on **Stop** button
 - **Measurement time** – actual time on your watch
 - **Cycles** – total number of cycles accumulated
- Map area
 - **Full** – use full captured image area for mapping
 - **Fixed** – use a fixed area for mapping
 - **Variable** – use a variable area for mapping each time

Map time		
<input type="radio"/> Manual		
<input checked="" type="radio"/> Measurement time [s]		100
<input type="radio"/> Cycles		10

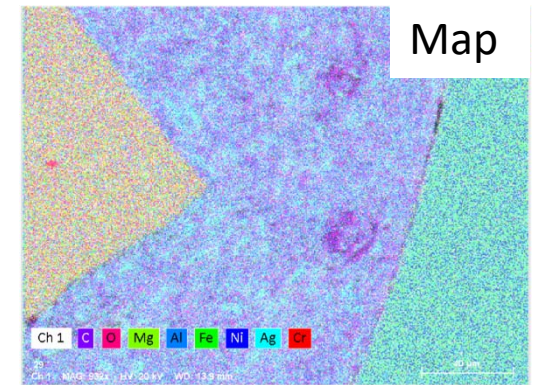
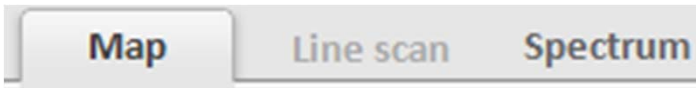
Map area		
<input checked="" type="radio"/> Full	<input type="radio"/> Fixed	<input type="radio"/> Variable
Map width	[μm]	Points
	219.86	512
Map height	219.86	384
Point distance	0.43	

4. Click **Acquire** to acquire a map
5. Click to view **Ch1** or **Map** using tab on upper left

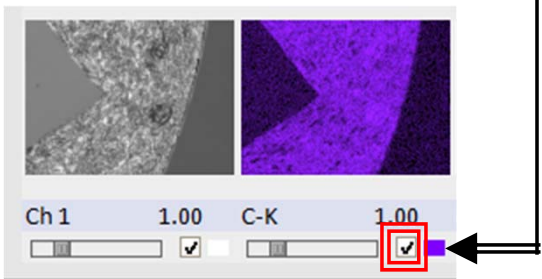


XVI. Mapping – 2/2

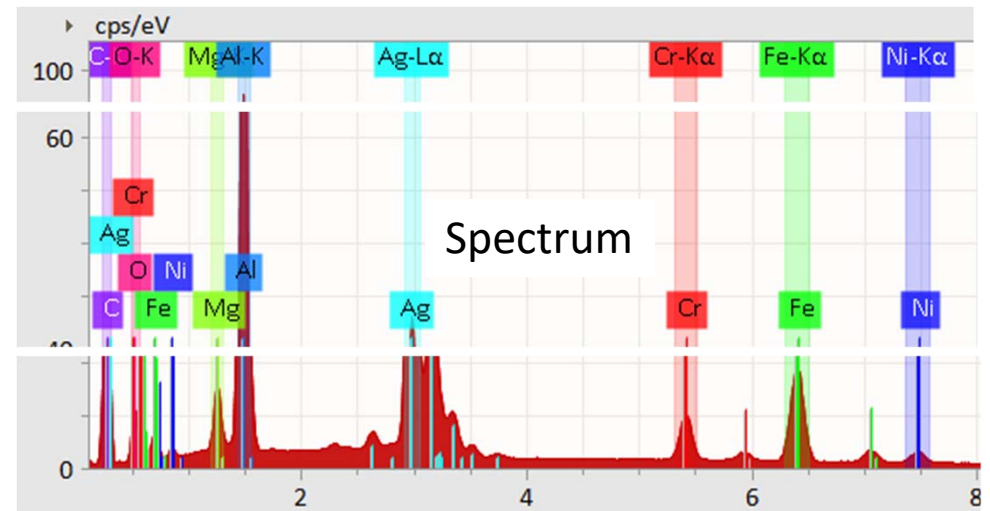
6. Click to view **Map** or **Spectrum** using tab on upper right



7. Individual element mapping overlays can be turned on/off



8. Click on **Quantify** to quantify the **ENTIRE** mapped area

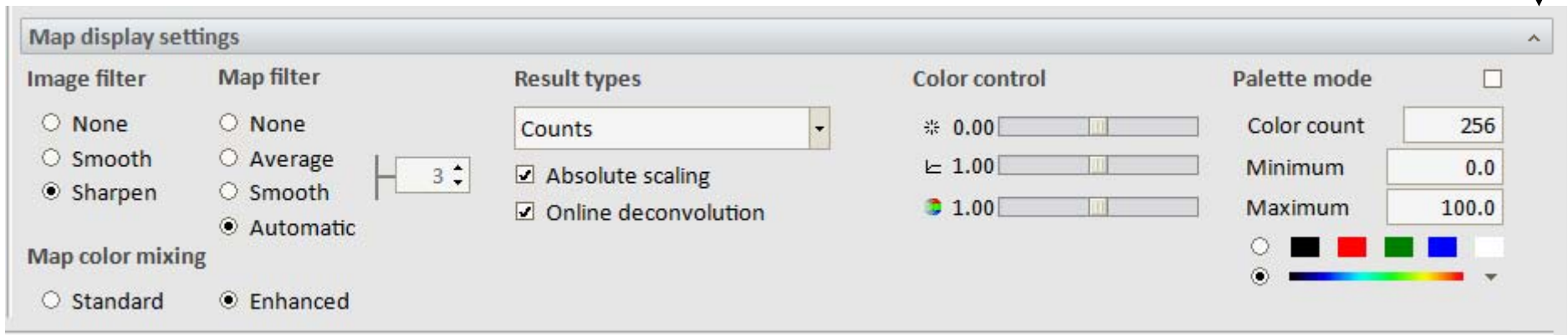


- Only Esprit 2.1 will allow you to quantify each pixel **AFTER** acquiring map
9. Click **Input/Output** icon to save or load data
- Use *.bcf file format to save HyperMaps (datacube)
 - **NOTE:** Esprit 2.1 will **ALLOW** further quantification on *.bcf files

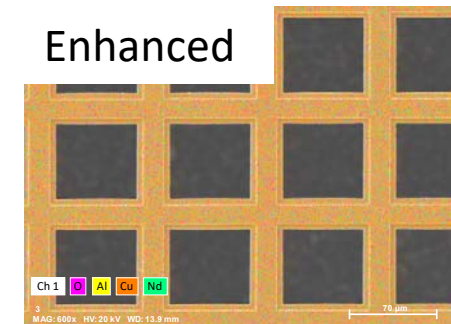
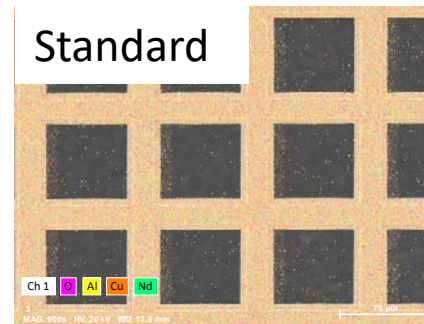


XVII. Mapping Processing – 1/3

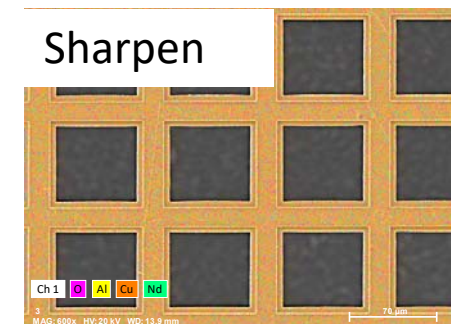
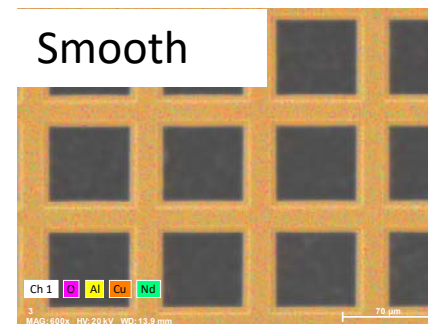
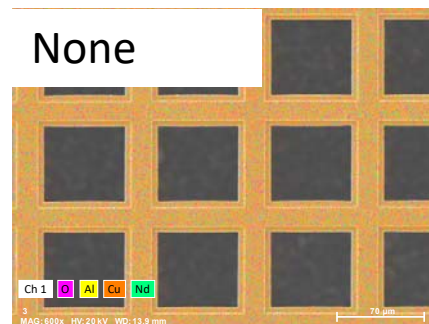
1. Click on the ∇ to open up *Map display settings*



2. Select desired *Map color mixing*: recommend *Enhanced*

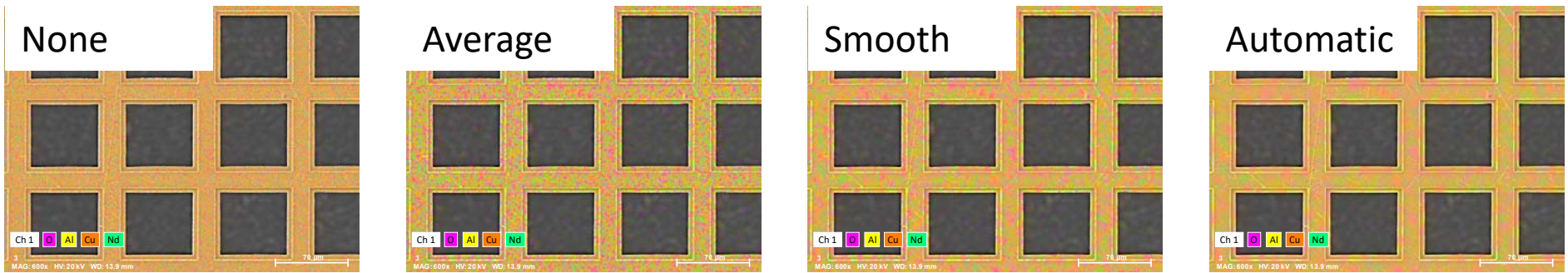


3. Select desired *Image filter*: recommend *Sharpen*



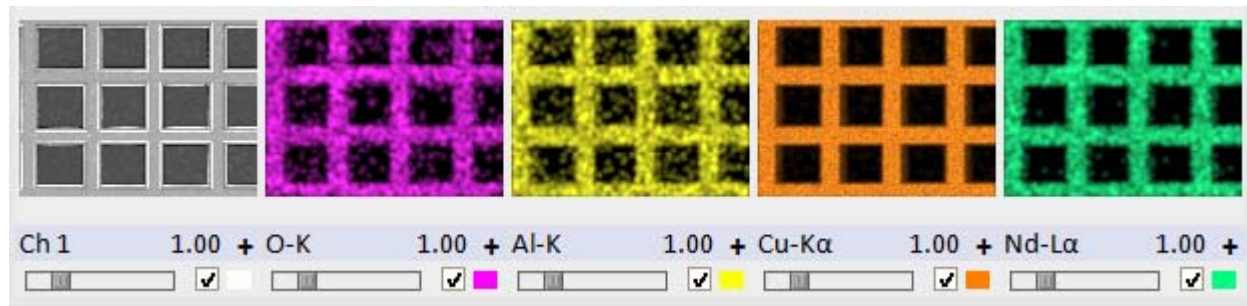
XVII. Mapping Processing – 2/3

4. Select desired **Map filter** – recommend **None** if sufficient counts

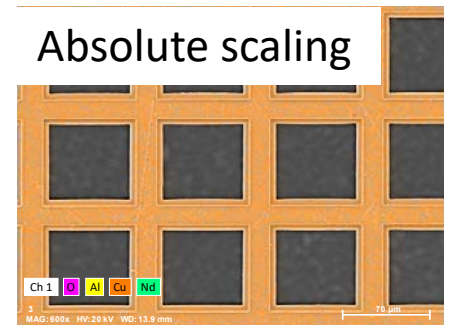


5. Consider adding **Result type**:

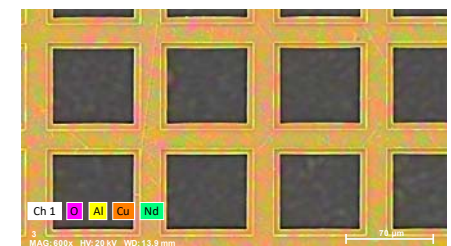
- **Absolute scaling** – scales selected elements to a maximum of 100, with color in composite element image being proportional to value of each element



- **Online deconvolution** – performs automatic background subtraction and element peak deconvolution



Online deconvolution



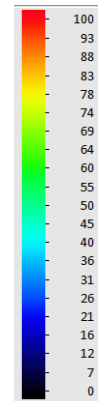
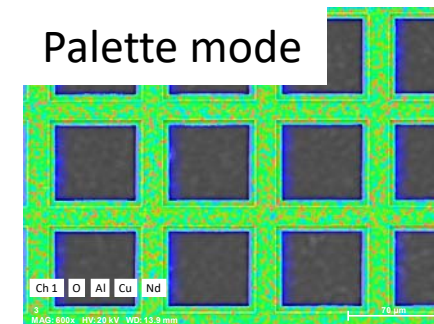
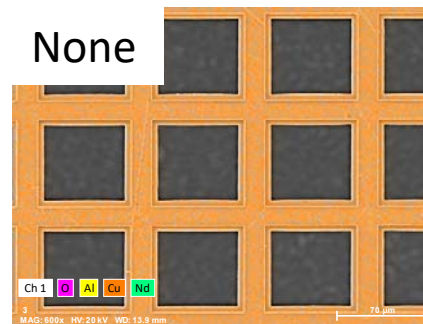
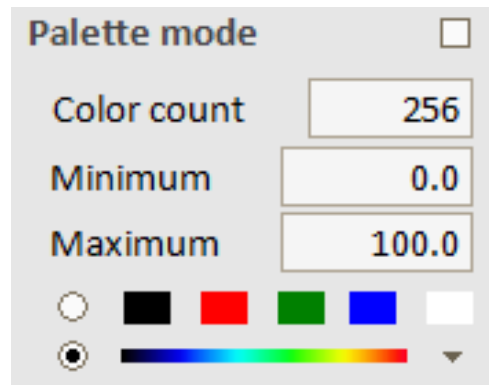
XVII. Mapping Processing – 3/3

6. Consider changing *Color control*:

- Brightness
- Gamma
- Color saturation

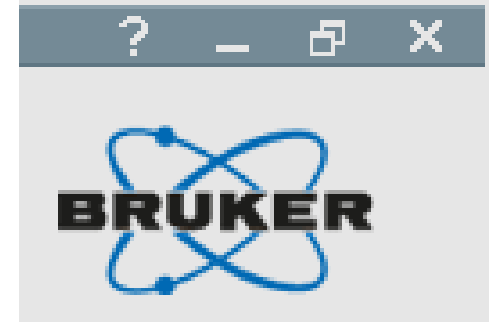


7. Consider changing *Palette mode*:



XVIII. Cleanup– 1/1

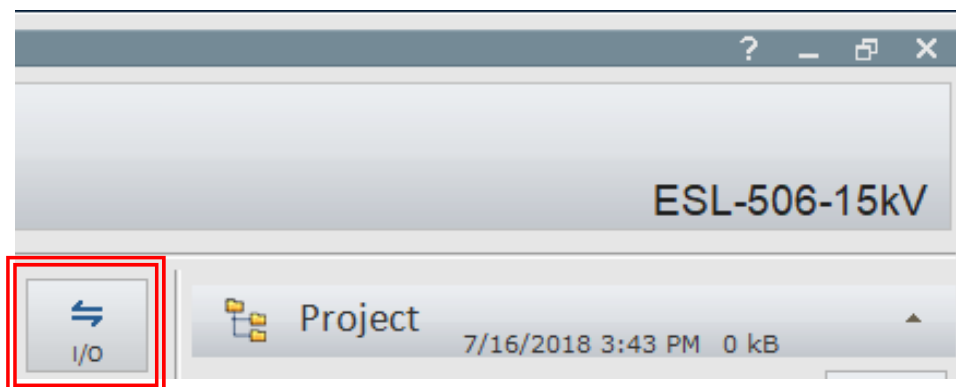
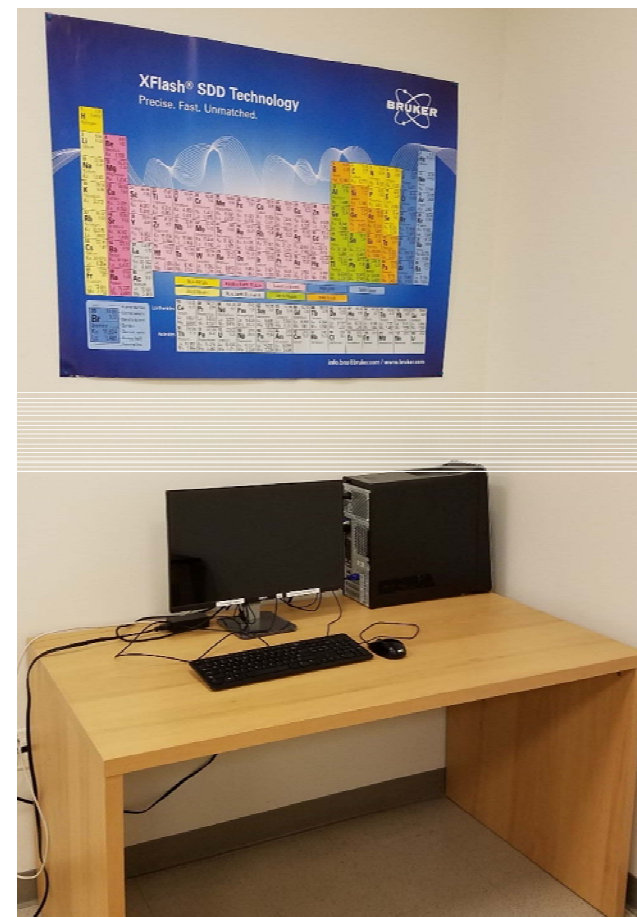
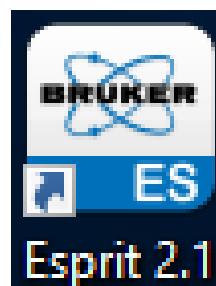
1. Turn off the Esprit Compact software by clicking on the **Close X** button
2. Continue to follow the **XVII. Sample Unloading** and **XVIII. Cleanup process** procedures outlined in the SEM training manual



XIX. QMap – 1/2

The following description applies to using saved mappings (*.bcf) files to be analyzed in ***Bruker Esprit 2.1*** software accessible on separate EDS computer

1. Double-click on ***ESPRIT 2.1*** icon to load software in separate EDS computer
2. Sign into your user account with your **Username** and **Password** or use the default student user account (student/student)
3. Load desired *.bcf file using the input/output button



XIX. QMap – 2/2

- Click on \vee to identify **QMap** parameters
- Load desired Method file if available
- Choose the appropriate **Method Mode**
 - Automatic** – quantification results automatically show up in spectrum list (default)
 - Interactive** – quantification dialog pops up
- Choose desired **Qmap** options
 - Tile size [pixel] – see estimated time
 - 1x1 – slowest
 - 2x2
 - 4x4
 - 8x8 – fastest
- Click **QMap** to start quantitative mapping
- Click on **Result types** to select desired quantification:
 - Counts
 - Net sum
 - Mass %
 - Mass % (norm.)
 - Atomic % (norm.)

