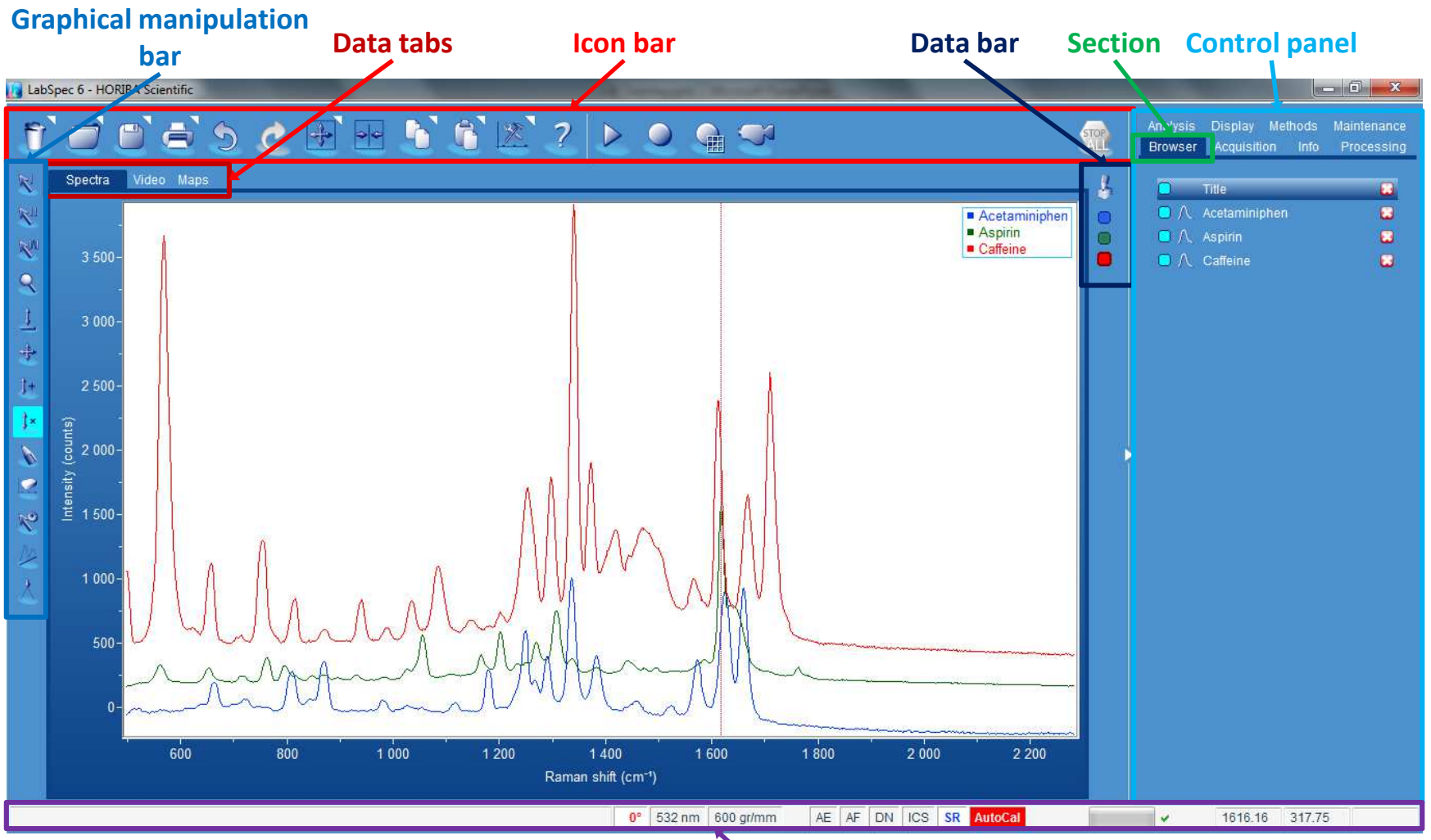
LabSpec 6.2 Tutorials

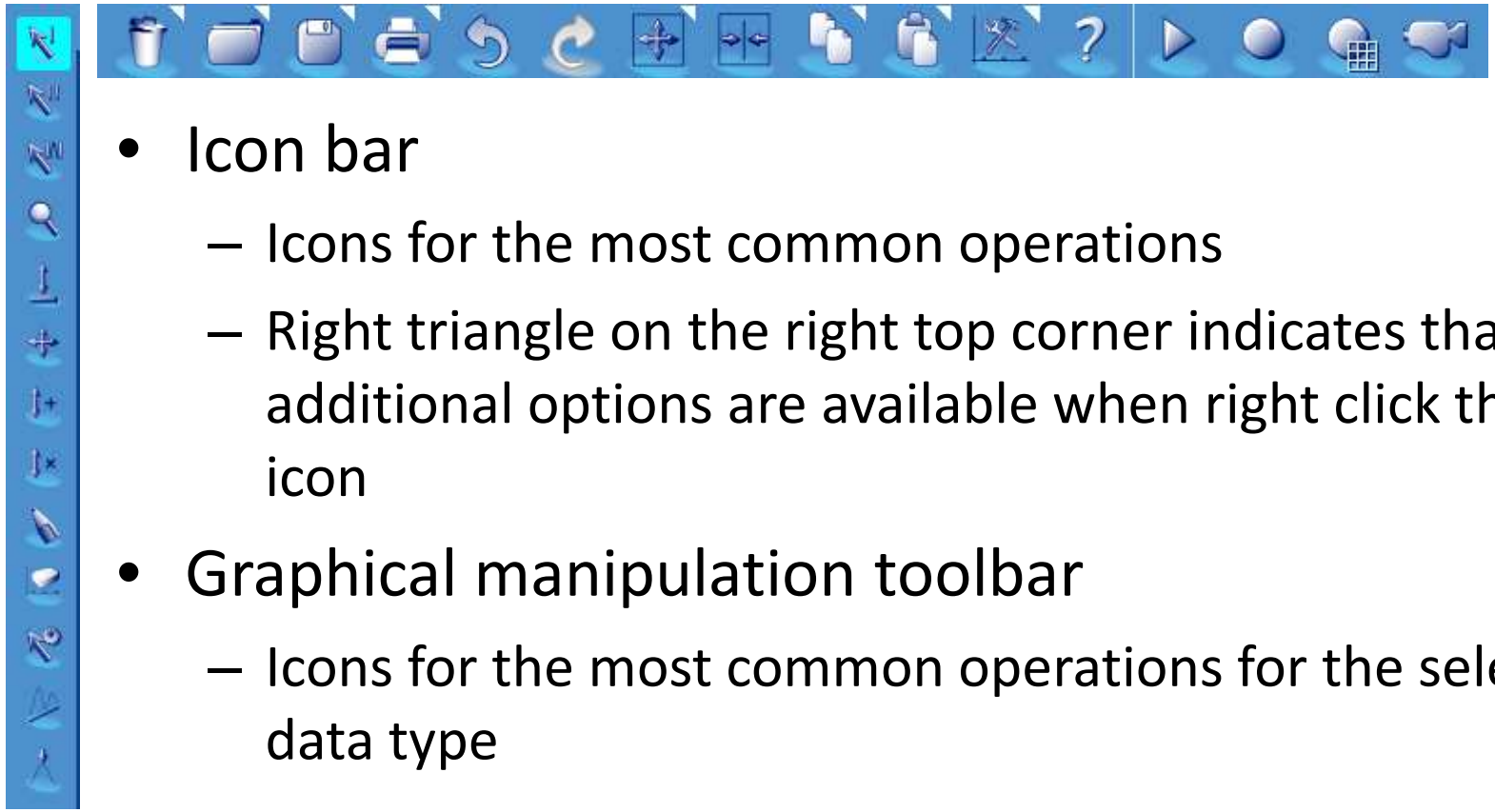
Main Interface



Main Interface

- Data are displayed in the center with multiple tabs (data tabs).
  - Spectra – single point spectra
  - Video – sample images
  - Maps – spectrum arrays + sample image
  - Additional tabs are opened/closed as necessary while data processing and analysis

Main Interface



- Icon bar
  - Icons for the most common operations
  - Right triangle on the right top corner indicates that additional options are available when right click the icon
- Graphical manipulation toolbar
  - Icons for the most common operations for the selected data type

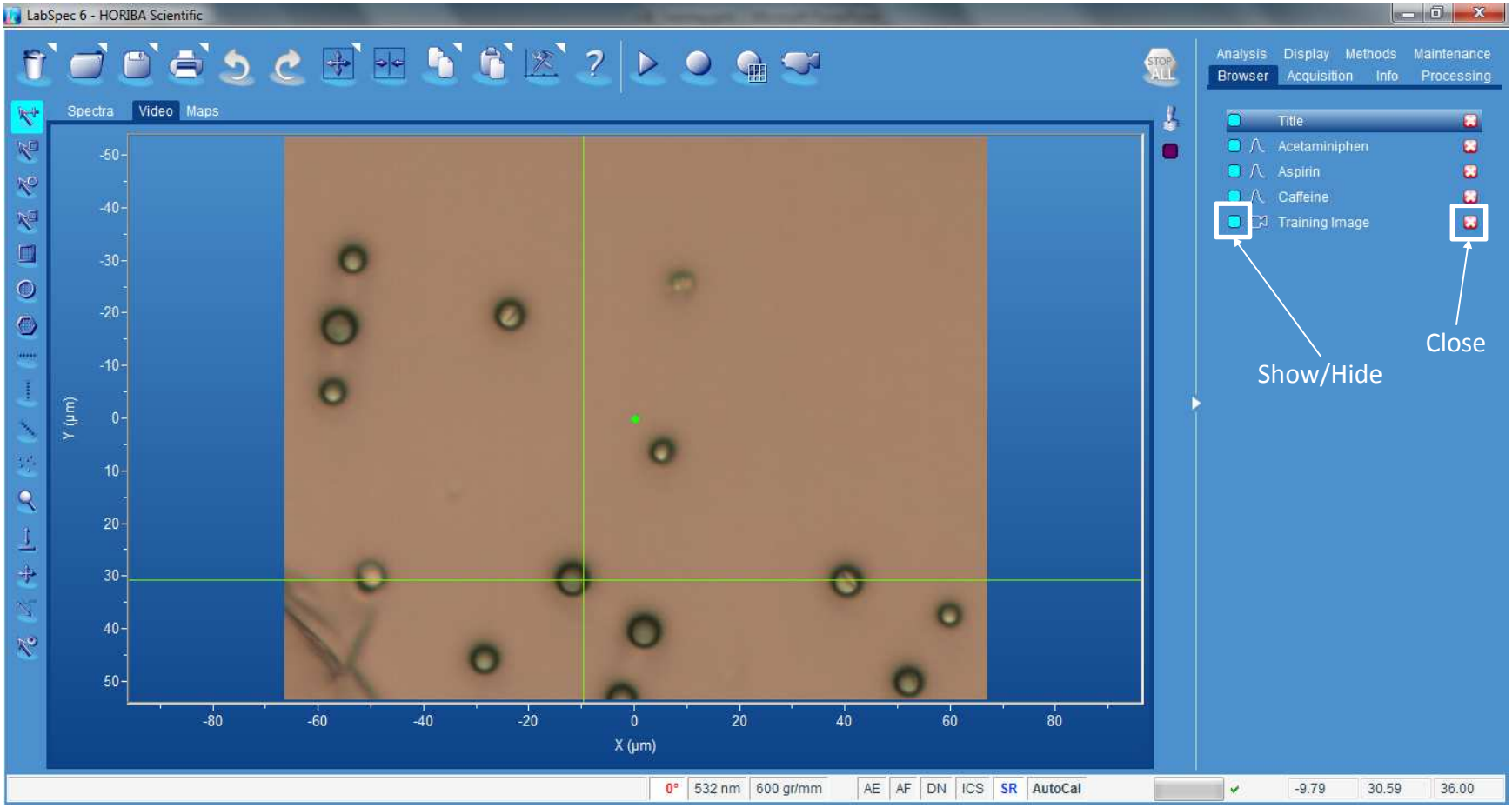
Main Interface

- Status bar at the bottom
  - Detector temperature
  - Selected laser and grating
  - On/Off AutoExposure (AE), AutoFocus (AF), DeNoiser (DN), Intensity Correction System (ICS), Instant Processing (IP) and Spectral Range (SR)
  - Icon for AutoCal
  - Progress bar
  - Values of the selected position
    - Spectrum: Cursor positions, distance between positions, intensity

Main Interface

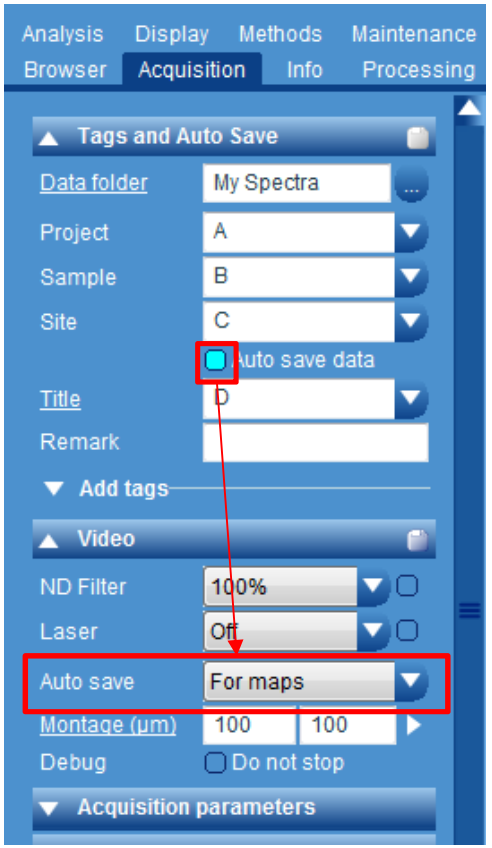
- All instrument and experiment controls are compiled on the right (Control Panel) with multiple tabs (Section).
  - Browser: View and manage data
  - Acquisition: Data acquisition
  - Info: Data information
  - Processing: Data processing
  - Analysis: Data analysis
  - Display: Setup display options
  - Methods: Create, manage and execute macros
  - Maintenance: Perform spectral axis calibration automatically

Browser Section



Acquisition Section

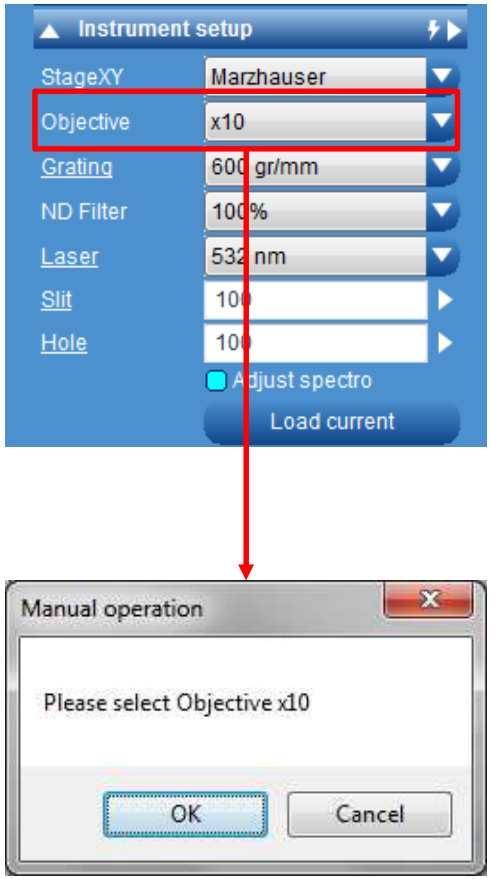
- Tags and Auto Save
  - Customize the data storage structure for Auto Save
- Video
  - Montage: Record a large (larger than the field of view) image by stitching multiple images together
  - AutoSave: When Auto Save Data is selected in Tag and Auto Save module, an image of the sample is recorded and saved in the same name as the spectrum or map data file.
- *Underlined text indicates that additional options are available when left click the text*



Exercise

Record an Image

- Select a sample (e.g. powder)
- Place the sample (e.g. a speck of powder) on a microscope slide
- Place the microscope slide on the stage
- Select a low magnification objective lens (e.g. 10×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.



Exercise

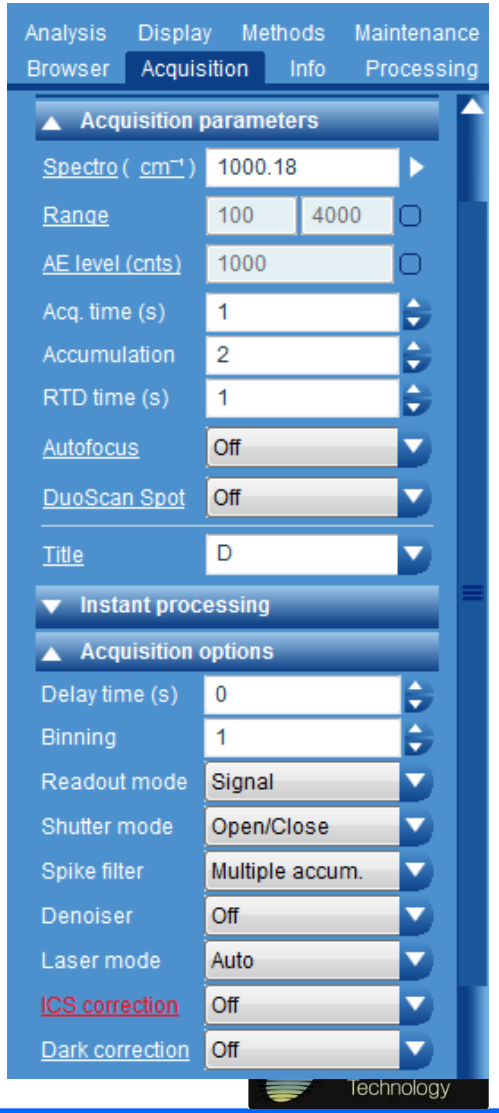
Record an Image

- Start video 
- Find the desired location and focus
- Select a high magnification objective lens (e.g. 50×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.
- Find the desired location and focus
- Stop video 

- Save the image 

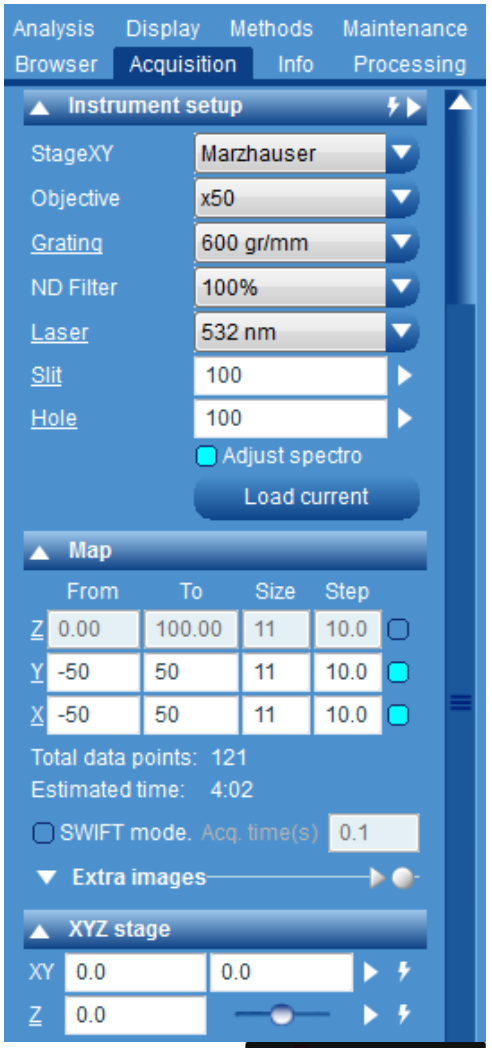
Acquisition Section

- Acquisition parameters
  - Range: Record a spectrum over an arbitrary spectral range. When turned on, status bar marks its use with **SR**.
  - Auto Exposure (AE) and Autofocus (AF) are controlled in this module. When turned on, status bar marks their use with **AE** and **AF**.
  - DuoScan is controlled in this module.
- Acquisition options
  - Intensity Correction System (ICS) is controlled in this module. When turned on, status bar marks its use with **ICS**
  - Denoiser: Apply an advanced noise filter to the acquiring spectrum



Acquisition Section

- Instrument setup
  - Adjust spectro: Maintain the spectral position when changing lasers or gratings
- Map
  - Setup to record a spectrum array (e.g. XY-map, Z-profile or t-pofile)
  - Control SWIFT in this module
- XYZ stage
  - Reset the position counter at will
  - XYZ positions are with respect to the last counter reset position



Exercise

Record a Spectrum

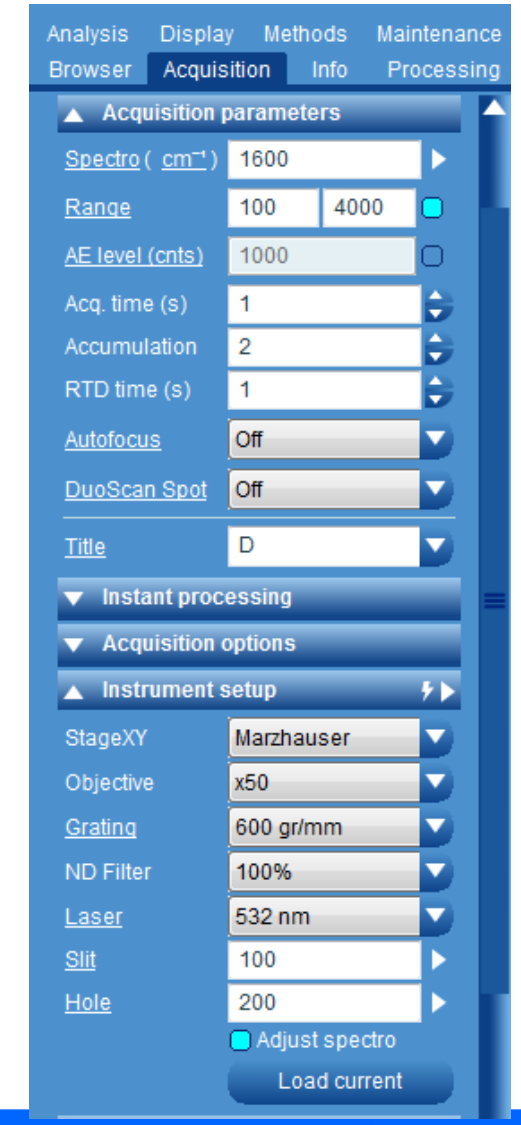
- Select a sample (e.g. polymer)
- Place the sample (e.g. a piece of polymer) on a microscope slide
- Place the microscope slide on the stage
- Select a low magnification objective lens (e.g. 10×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.
- Start video 
- Find the desired location and focus

Exercise

Record a Spectrum

- Select a high magnification objective lens (e.g. 50×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.
- Find the desired location and focus
- Stop video 

- Save the image 
- Select Grating (e.g. 600 gr/mm)
- Select Laser (e.g. 532 nm)
- Set Slit (e.g. 100 µm)
- Set Hole (e.g. 200 µm)
- Set ND filter (e.g. 100 %)

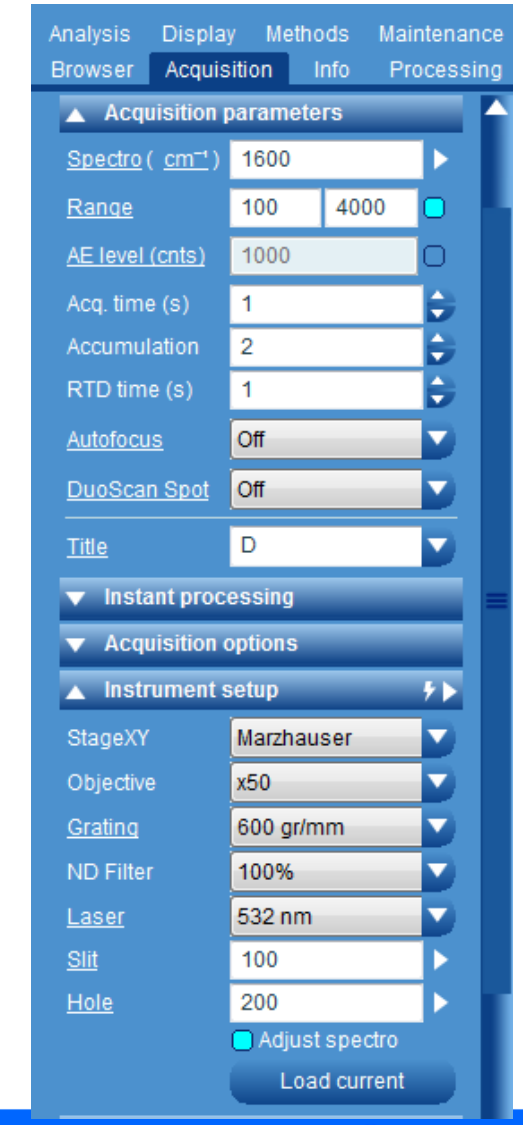


Exercise

Record a Spectrum

- Set Spectro (e.g. 1600)
- Set RTD time (s) (e.g. 1)
- Start Real Time Display (RTD) 
- Stop RTD 

- Review the spectral features. Determine, select and set the Range to record the spectrum (e.g. 100 - 4000)
- Set Acq time (s) (e.g. 1)
- Set Accumulation (e.g. 2)
- Unselect AE level; turn off Autofocus; turn off DuoScan Spot
- Start Spectrum Acquisition 
- Save the spectrum 



HORIBA Scientific

Explore the future

Automotive Test Systems | Process & Environmental | Medical | Semiconductor | Scientific

HORIBA

Save and Export

- Left click Save as Data icon 
  - Save As window opens.
  - Save the data in LS6, LS5, LS4, GRAMS, or Text format
  - You can save the entire configuration
- Right click Save as Data Icon

  - Activates the pop-up menu.
  - Batch export to LS4, LS5, LS6, GRAMS or Text format
  - Save to group file: Save all data in the tab to a single file When opened, individual identity is maintained
  - Save all files: Save all data in the tab to individual files

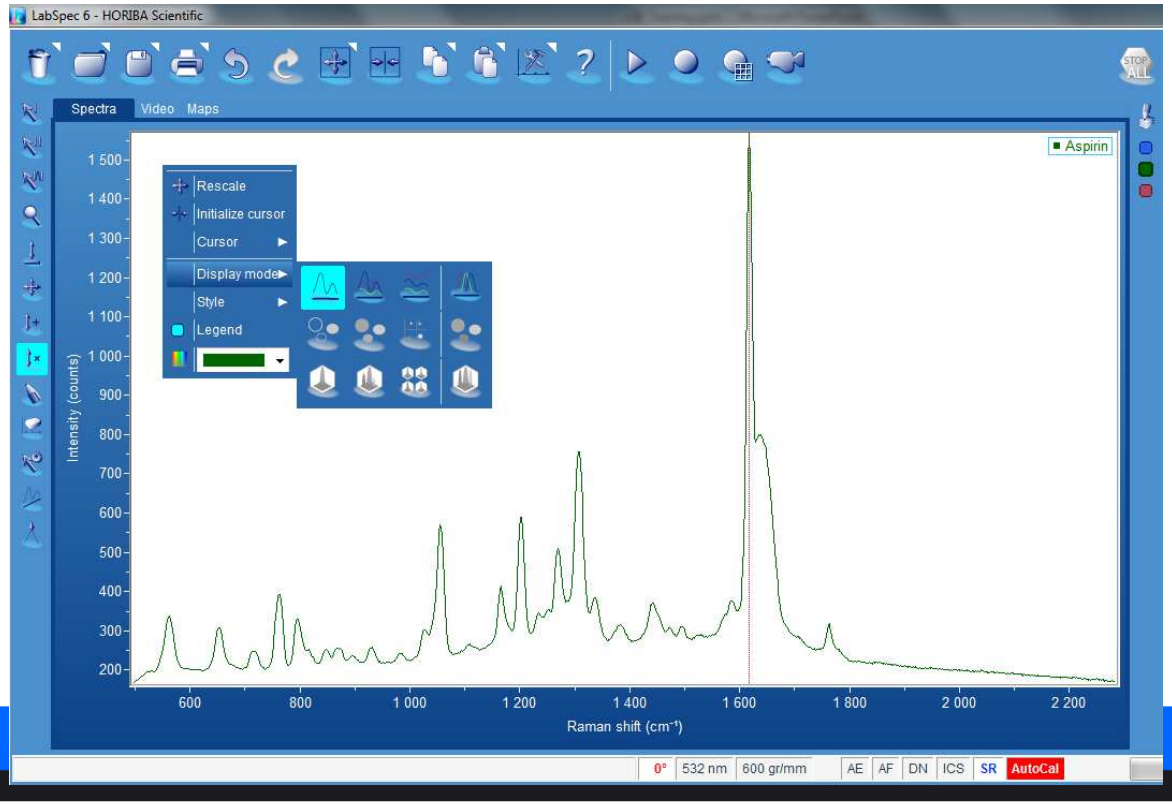
Open and Import

- Left click Open file icon 
  - Open window opens
  - Open a data file
    - Single spectrum in LS4, LS5, LS6, GRAMS or Text format
    - Multi spectrum (or a spectrum array) in LS4, LS5 or LS6 format
    - Image in LS4, LS5, LS6, TIFF, BitMap or JPeg format
    - Arbitrary data in Text format
- Right click Open file icon
  - Open recently opened files

Exercise

Visualize Spectra

- Open three spectra (e.g. Acetaminophen, Aspirin and Caffeine)
- Right click within Spectra tab, and then bring mouse point to Display mode. Select Single mode to display the currently selected spectrum (e.g. Aspirin in green).



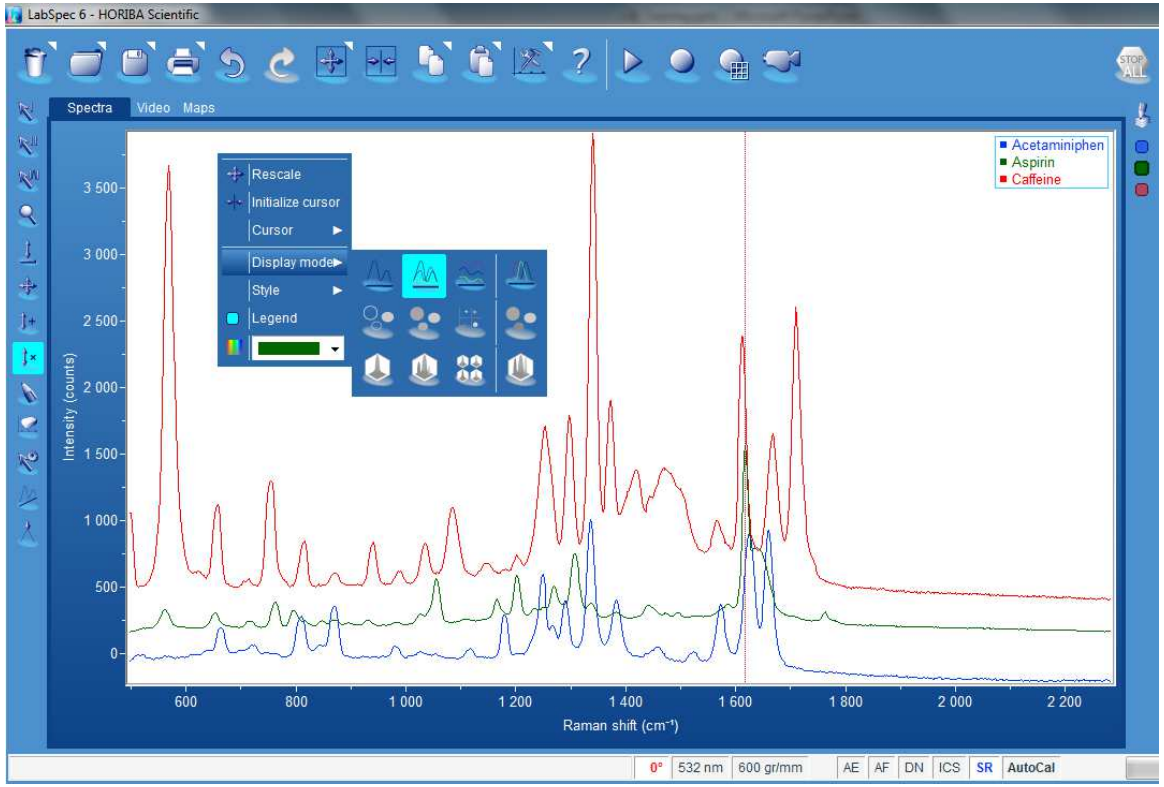
HORIBA Scientific
Explore the future

JOBIN YVON Technology
HORIBA

Exercise

Visualize Spectra

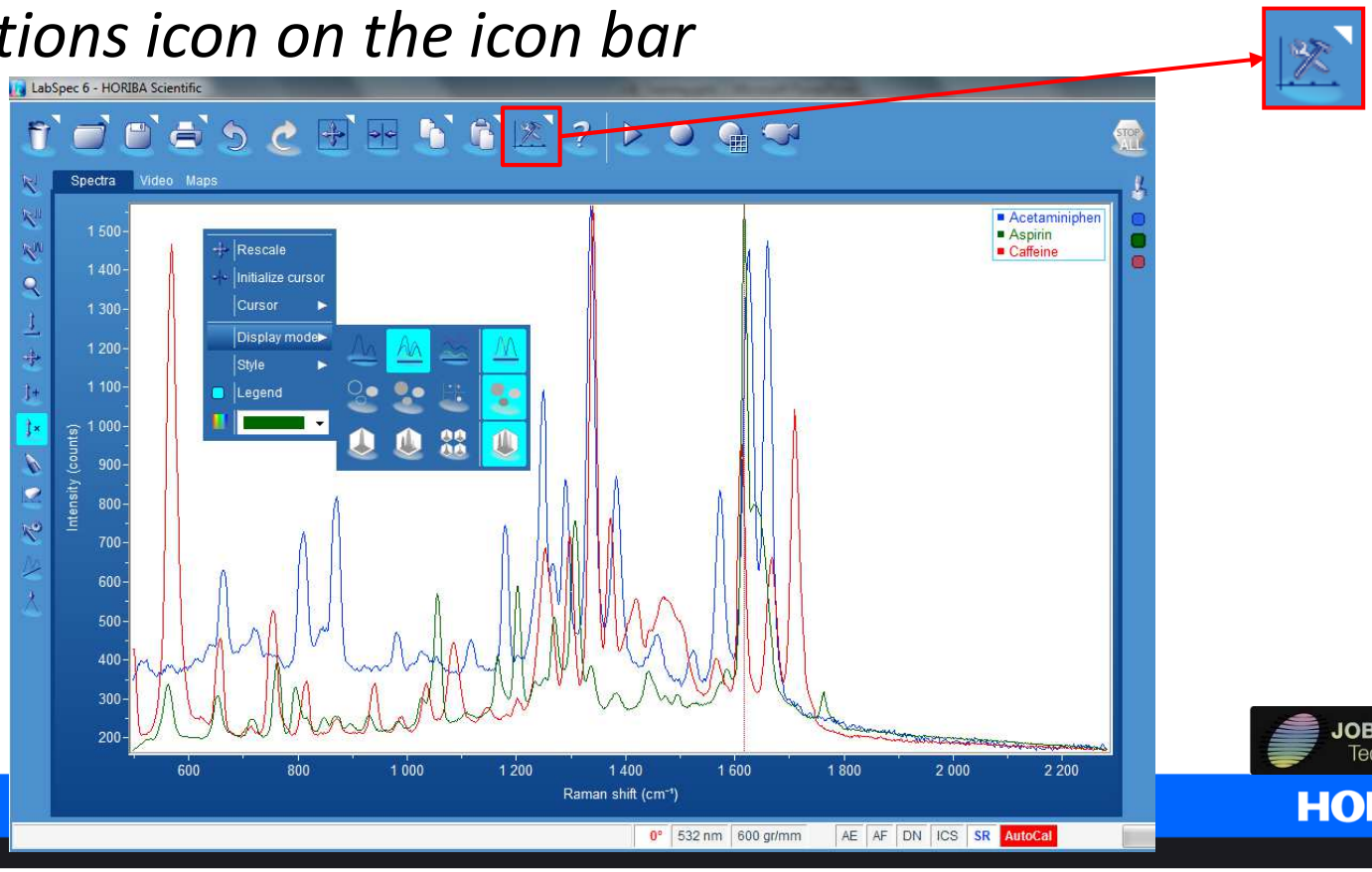
- Right click within the Spectra tab, and then bringt mouse point to Display mode. Select Overlay mode to display all spectra using the same intensity scale



Exercise

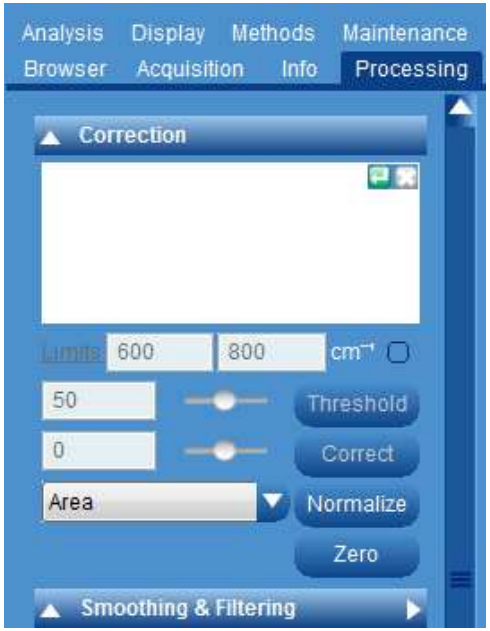
Visualize Spectra

- Right click within the Spectra tab, and then bring mouse point to Display mode. Select Normalize to display all spectra using individual intensity scales.
- *These operations are also accessible by clicking Display Functions icon on the icon bar*



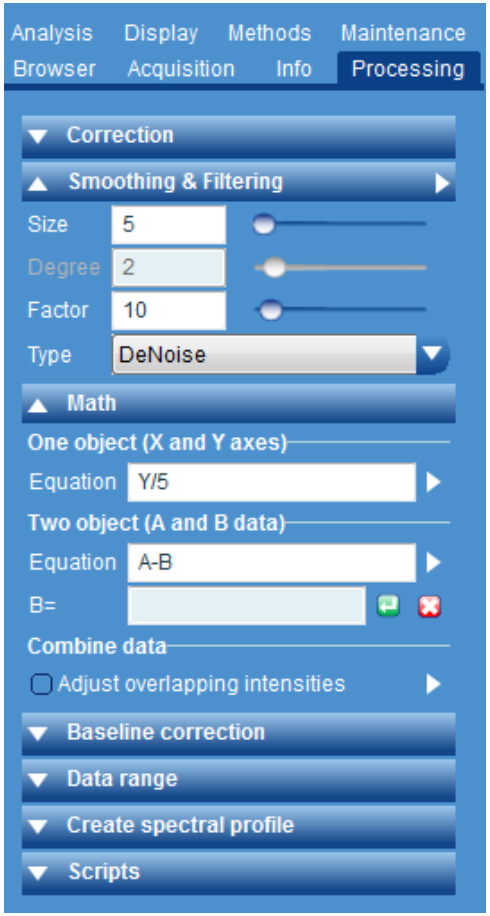
Processing Section

- Correction
  - Threshold: Applicable to a spectrum array only. Reset low intensity spectra to all zeros.
  - Correct: Subtract a spectrum (e.g. a solvent spectrum) from a series of spectra. May apply a scale.
  - Normalize: Normalize to unit intensity sum, unit spectrum area, maximum intensity, unit vector, and normal variate.



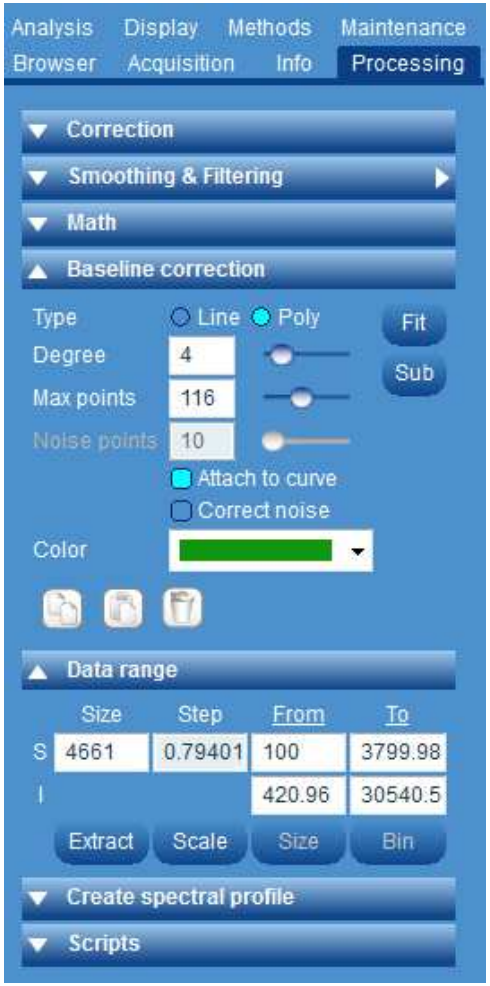
Processing Section

- Smoothing and filtering
  - Denoizer is the identical operation as in Acquisiton tab
  - 1st and 2nd derviative
- Math
  - Unary or binary operations
  - Within a spectrum or between spectra



Processing Section

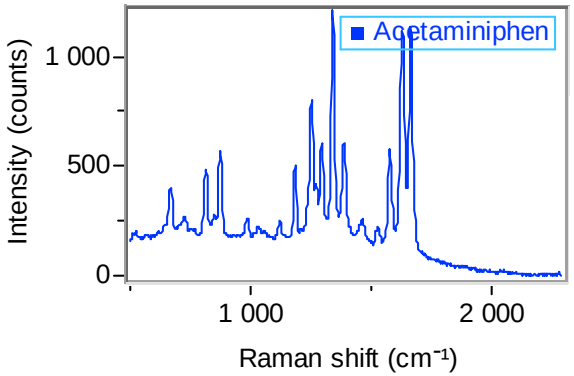
- Baseline correction
  - Polynomial curve or line segments
  - Up to 256 anchor points
  - Copy the baseline of one spectrum, and paste to another spectrum for duplication
- Data range
  - Truncate, rescale or resize data ranges

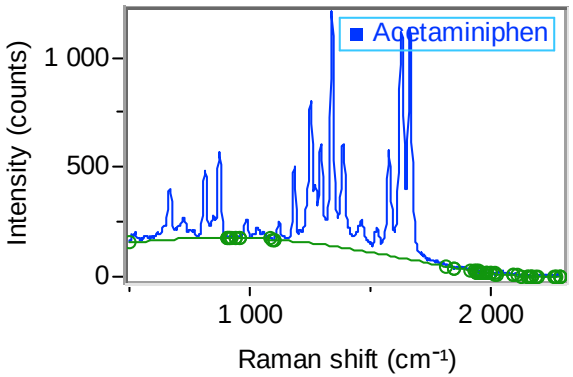


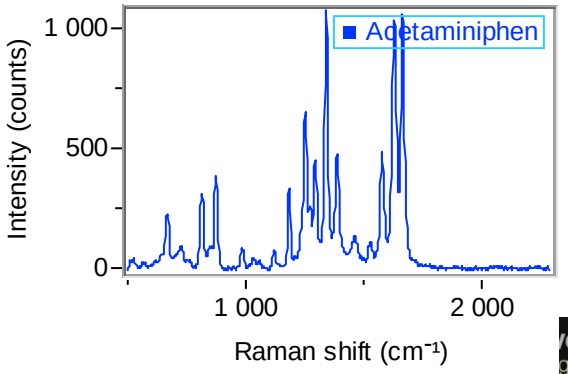
Exercise

Process a Spectrum

- Baseline correction
  - Select a spectrum (e.g. Acetaminophen)
  - Click Fit
  - Adjust Degree and Max points as necessary
  - Click Sub

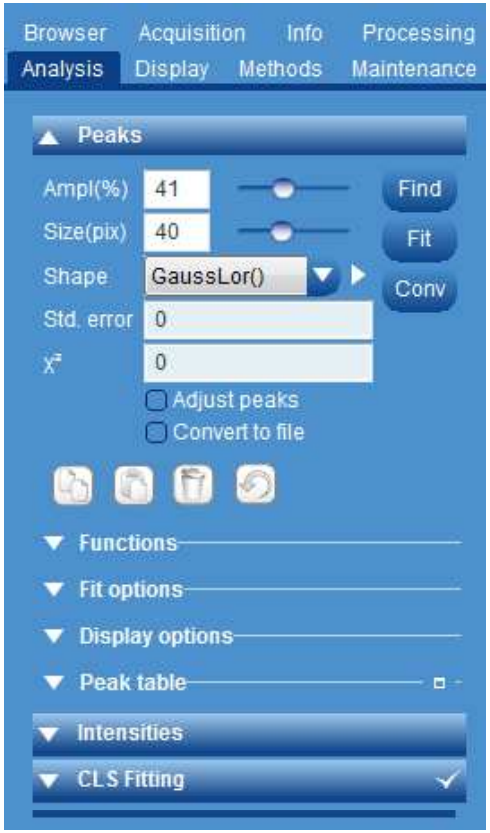






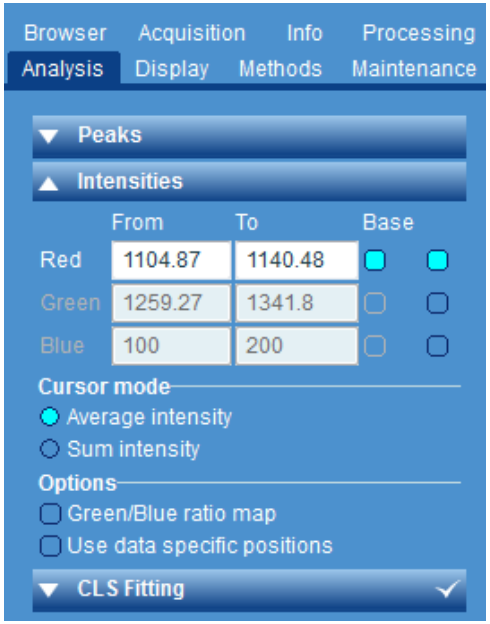
Analysis Section

- Peaks
  - Peak fitting using standard or custom functions
    - Standard functions: Gaussian, Lorentzian, Gaussian+Lorentzian, Asymmetric Gaussian, Asymmetric Lorentzian or Asymmetric Gaussian+Asymmetric Lorentzian
    - Custom functions are operator defined.
  - May fit the baseline while peak fitting
  - Results include peak positions, peak heights, bandwidths (full widths at half maximum) and peak areas



Analysis Section

- Intensities
  - Applicable to a spectrum array only
  - Map the designated peak intensities with or without baseline correction
  - May map a ratio of two peak intensities
  - Use data specific positions
    - When checked, peak designations are applied to, and saved with the target data.
    - When unchecked, peak designates are applied to all data including currently acquiring data.



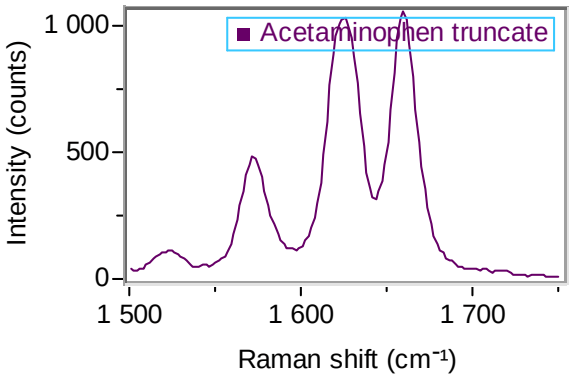
Analysis Section

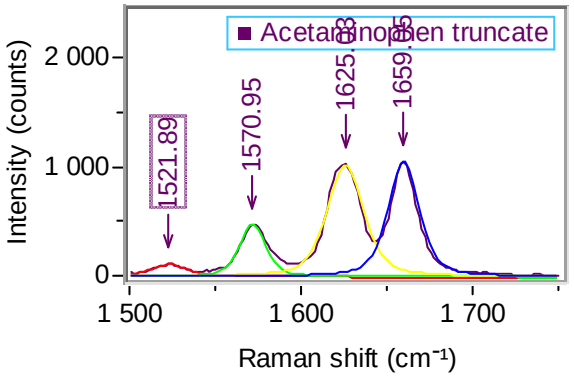
- CLS fitting
  - Applicable to a spectrum array or a spectrum
  - Reuquire reference spectra. The score indicates the similarity of the target spectrum with respect to the reference spectrum.
  - Use data specific models
    - When checked, reference spectra are applied to, and saved with the target data.
    - When unchecked, reference spectra are applied to all data including currently acquiring data.

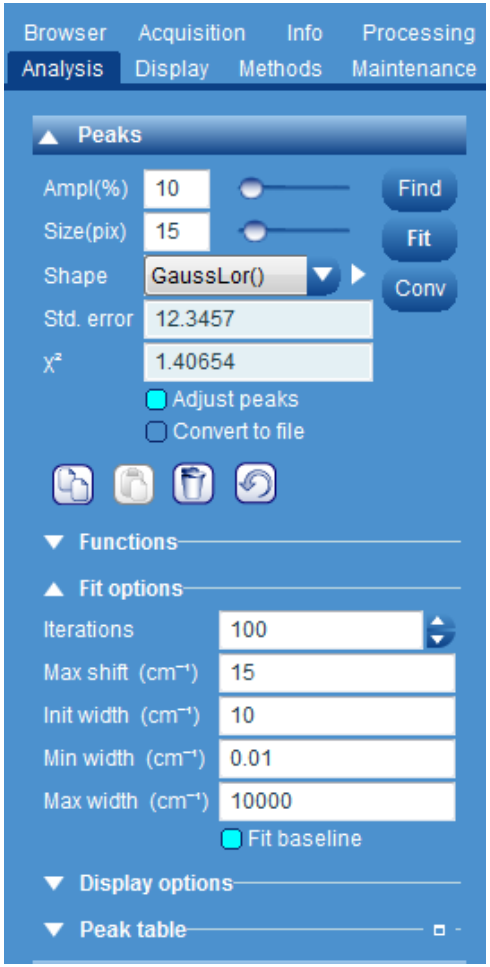
Exercise

Analyze a Spectrum

- Peak fitting
  - Select a spectrum (e.g. Acetaminophen truncate)
  - Select Shape (e.g. GaussLor() for Gaussian+Lorentzian function)
  - Click Find



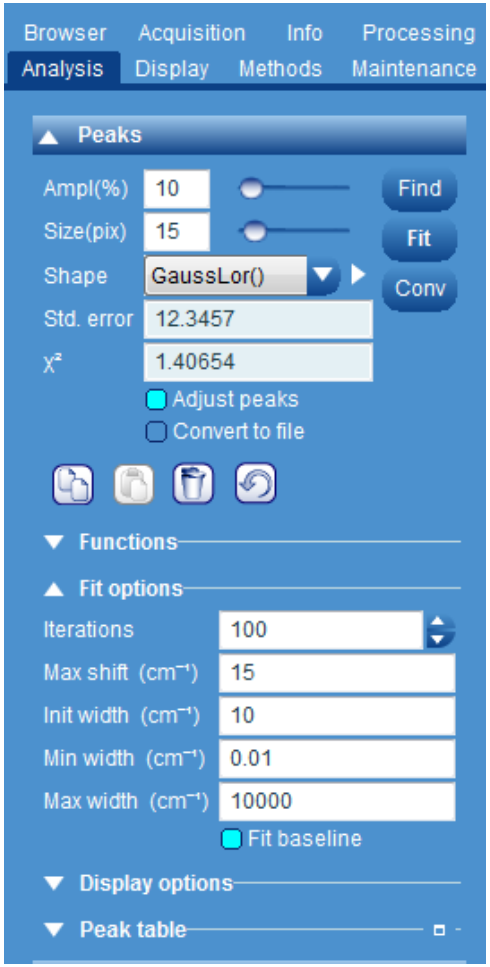




Exercise

Analyze a Spectrum

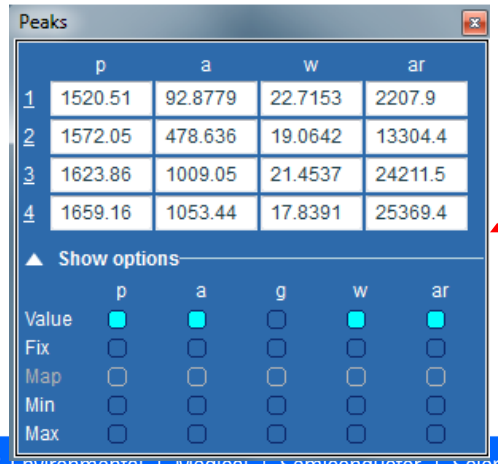
- Peak fitting (cont'd)
  - Click Fit options to expand
    - Iterations: 100
    - Max shift: 15
    - Init width: 10
    - Min width: 0.01
    - Max width: 1000
  - Click Fit. Repeat if necessary until there is no change in Std error and χ^2.

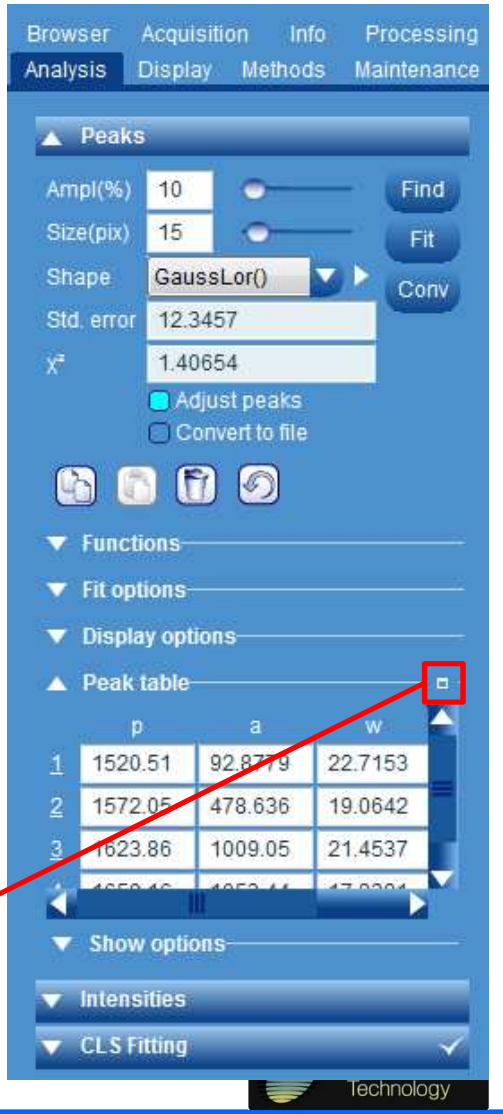


Exercise

Analyze a Spectrum

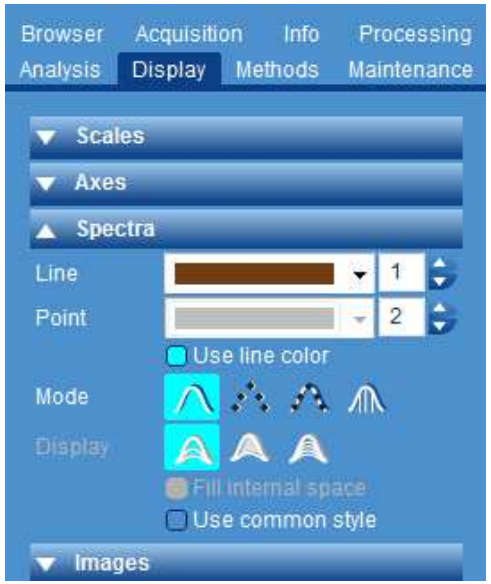
- Peak fitting (cont'd)
  - Click Peak table to expand, and then click the button on the right top corner to popup the peak table
  - Click Show options to expand. In Value row of Show options, check p (peak position), a (peak height), w (FWHM) and ar (peak area)
  - Click Conv to convert the data to the fitted result if desired.

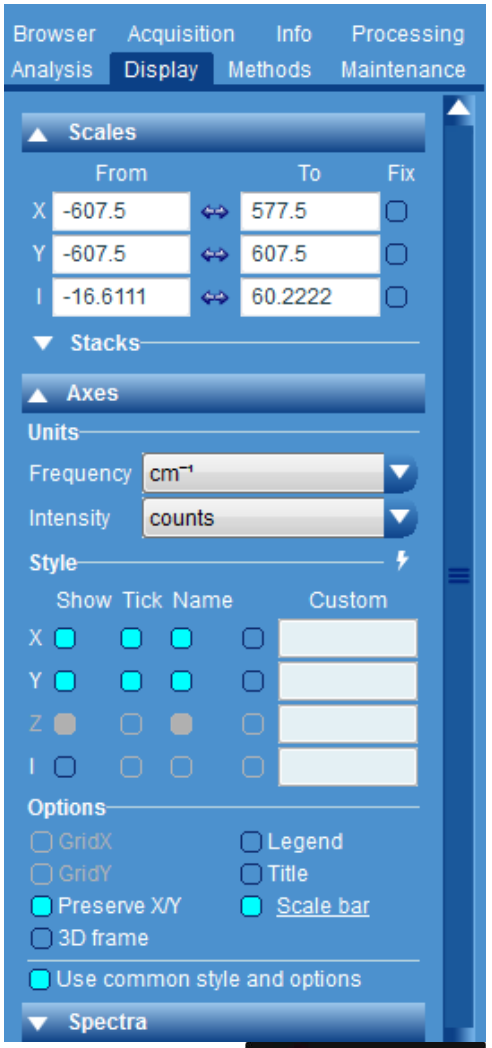




Display Section

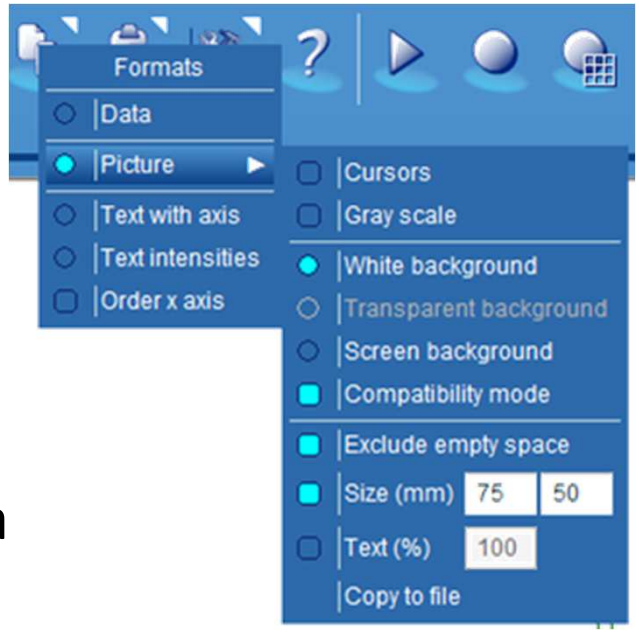
- Scales
  - May fix or reverse the axis scales
- Axes
  - Select axis units for spectrum
  - On/Off axis
- Spectra
  - Adjust line thickness





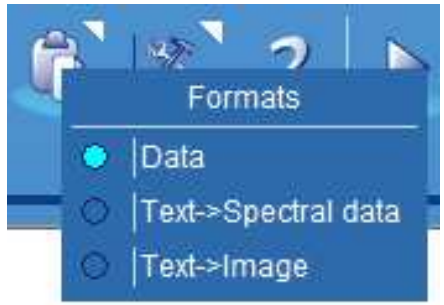
Copy

- Right click Copy icon 
  - Setup the copy options
  - Data: Copy the current data set as the same data type. Paste to the same tab/window
  - Picture: Copy the current tab (Spectra, Video or Map) display as a picture. Paste to another software (e.g. PowerPoint)
  - Text: Copy the current data set to the text format. Paste to another tab (e.g. Spetra Tab) or another software (e.g. Excel)



Paste

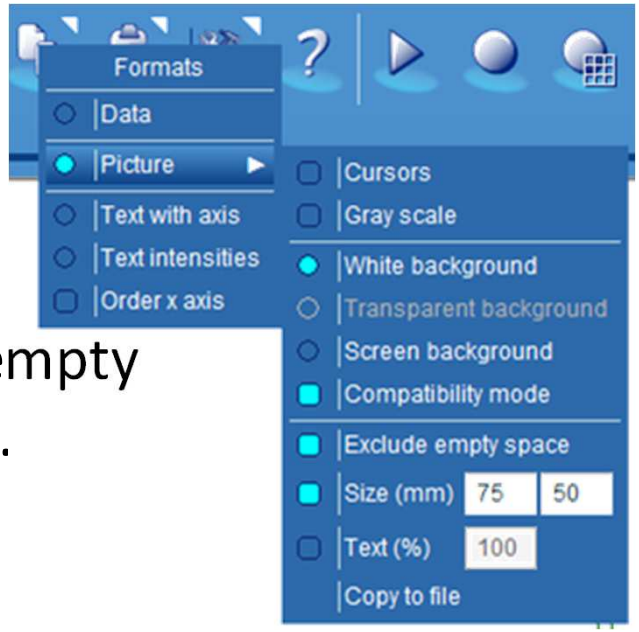
- Right click Paste icon 
  - Setup the paste options
  - Data: Paste the data in the memory to the same tab/window as the original data
  - Text → Spectral data: Paste the text in the memory as a spectra or a spectrum array.
  - Text → Image: Paste the text in the memory as an image.

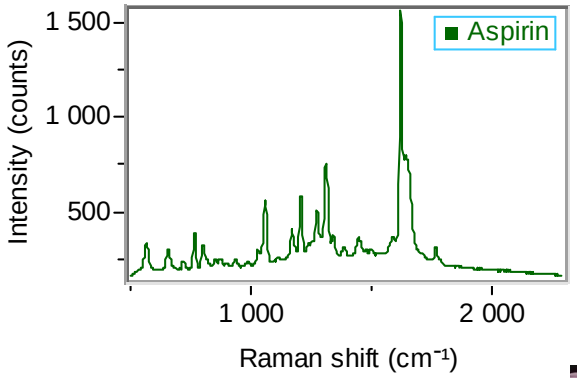


Exercise

Copy and Paste a Spectrum as a Picture

- Select a spectrum (e.g. Aspirin)
- Right click Copy icon
  - Select Picture
  - Check White background, Exclude empty space, Compatibility mode and Size. Uncheck the rest
  - Input 75 and 50 for Size
- Left click Copy icon
- Open PowerPoint and paste

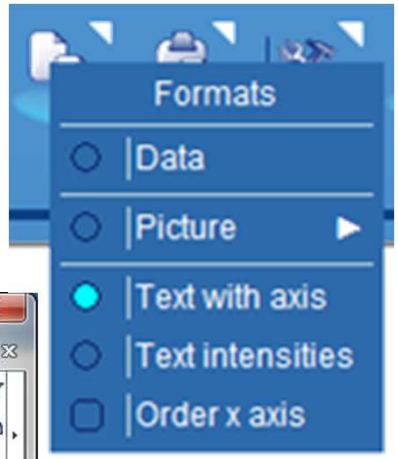


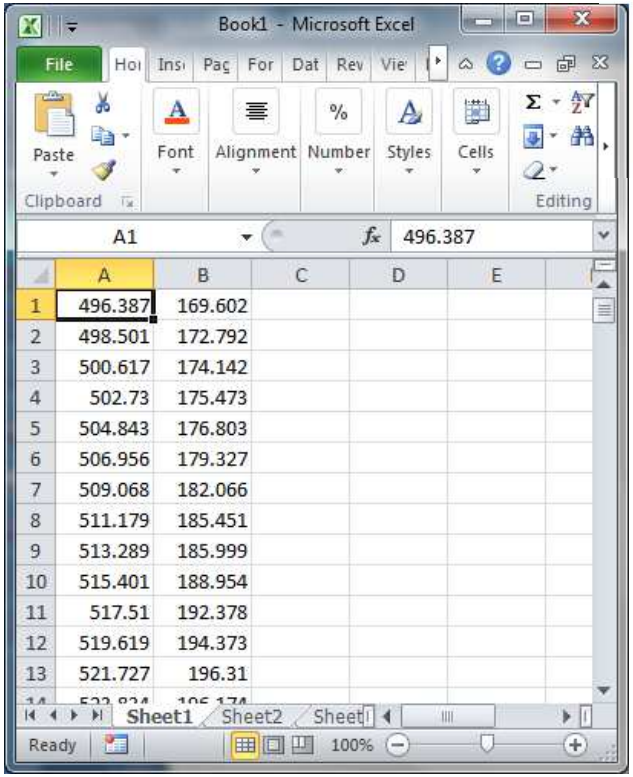


Exercise

Copy and Paste a Spectrum as Text

- Select a spectrum (e.g. Aspirin)
- Right click Copy icon
  - Select Text with axis
- Left click Copy icon
- Open Excel and paste

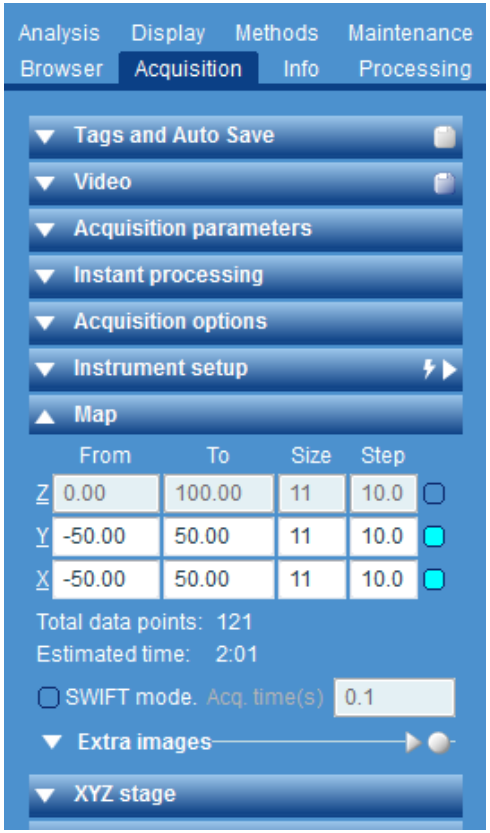




	A	B
1	496.387	169.602
2	498.501	172.792
3	500.617	174.142
4	502.73	175.473
5	504.843	176.803
6	506.956	179.327
7	509.068	182.066
8	511.179	185.451
9	513.289	185.999
10	515.401	188.954
11	517.51	192.378
12	519.619	194.373
13	521.727	196.31

Spectrum Array

- Spectrum array is a collection of spectra, typically acquired over a range of a variable (or variables) at a regular interval.
- Types of a spectrum array include
  - XY-map: a collection of spectra recorded over an area
  - Z-profile: a collection of spectra recorded over a range of height
  - t-profile: a collection of spectra recorded over a length of time
- Spectrum array is typically setup in Map module of Acquisition section



Exercise

Record a XY-Map

- Select a sample (e.g. tablet)
- Place the sample (e.g. a tablet) on a microscope slide
- Place the microscope slide on the stage
- Select a low magnification objective lens (e.g. 10×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.
- Start video 
- Find the desired location and focus

Exercise

Record a XY-Map

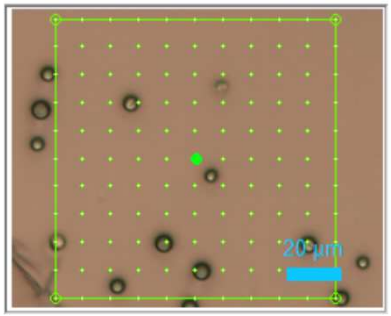
- Select a high magnification objective lens (e.g. 50×). Select the matching objective lens from the software, and then click OK when the message for the manual operation appears.
- Find the desired location and focus
- Stop video 

- Save the image 

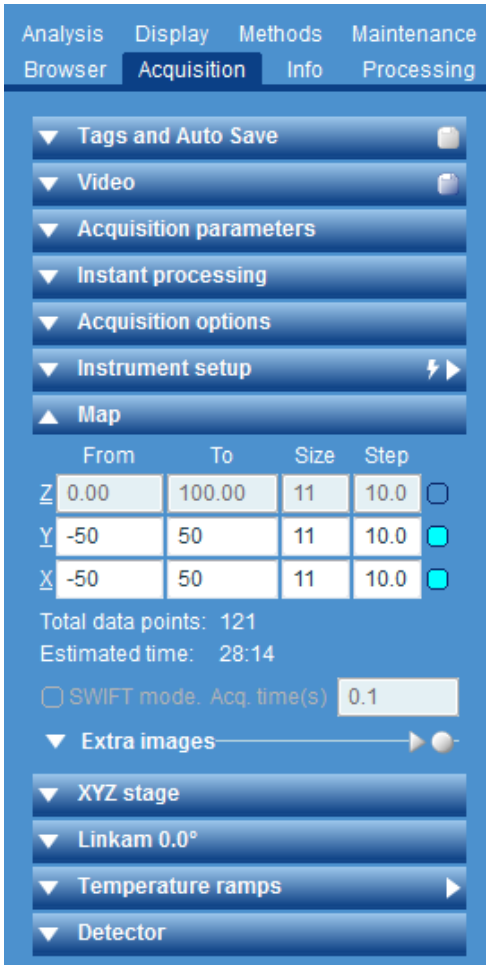
Exercise

Record a XY-Map

- Select the map shape (e.g. rectangle) from the graphical manipulation  toolbar.
- The cursor of the selected shape appears. Drag, strech and/or drop the cursor to mark the location and area of the map.



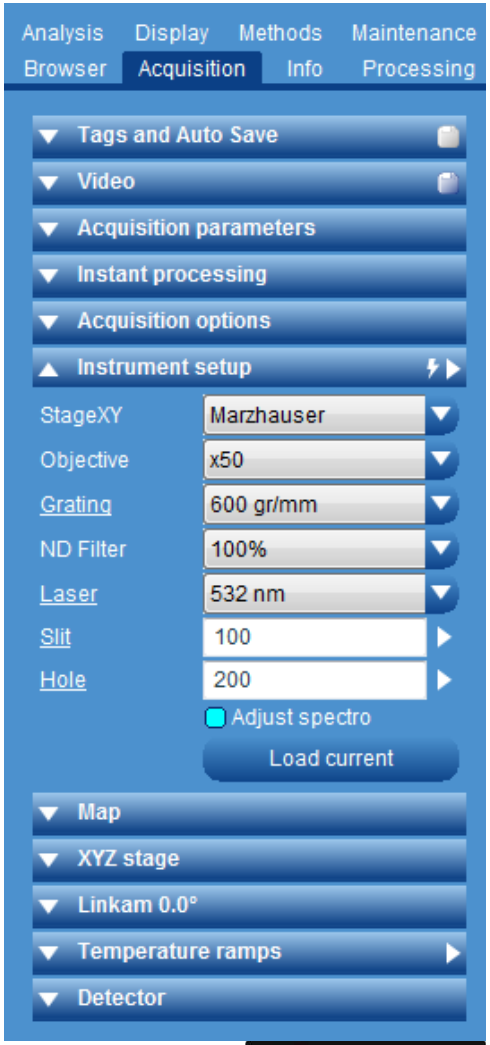
- Expand Map module, and set the number of measurement points (e.g. Size = 11). Measurement points are marked in the rectangle shaped cursor



Exercise

Record a XY-Map

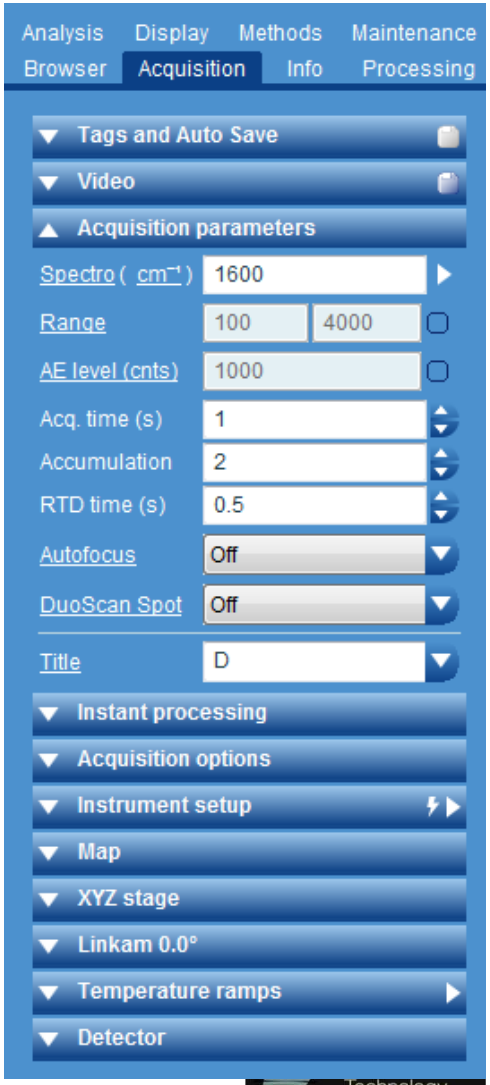
- Select Grating (e.g. 600 gr/mm)
- Select Laser (e.g. 532 nm)
- Set Slit (e.g. 100 µm)
- Set Hole (e.g. 200 µm)
- Set ND filter (e.g. 100 %)



Exercise

Record a XY-Map

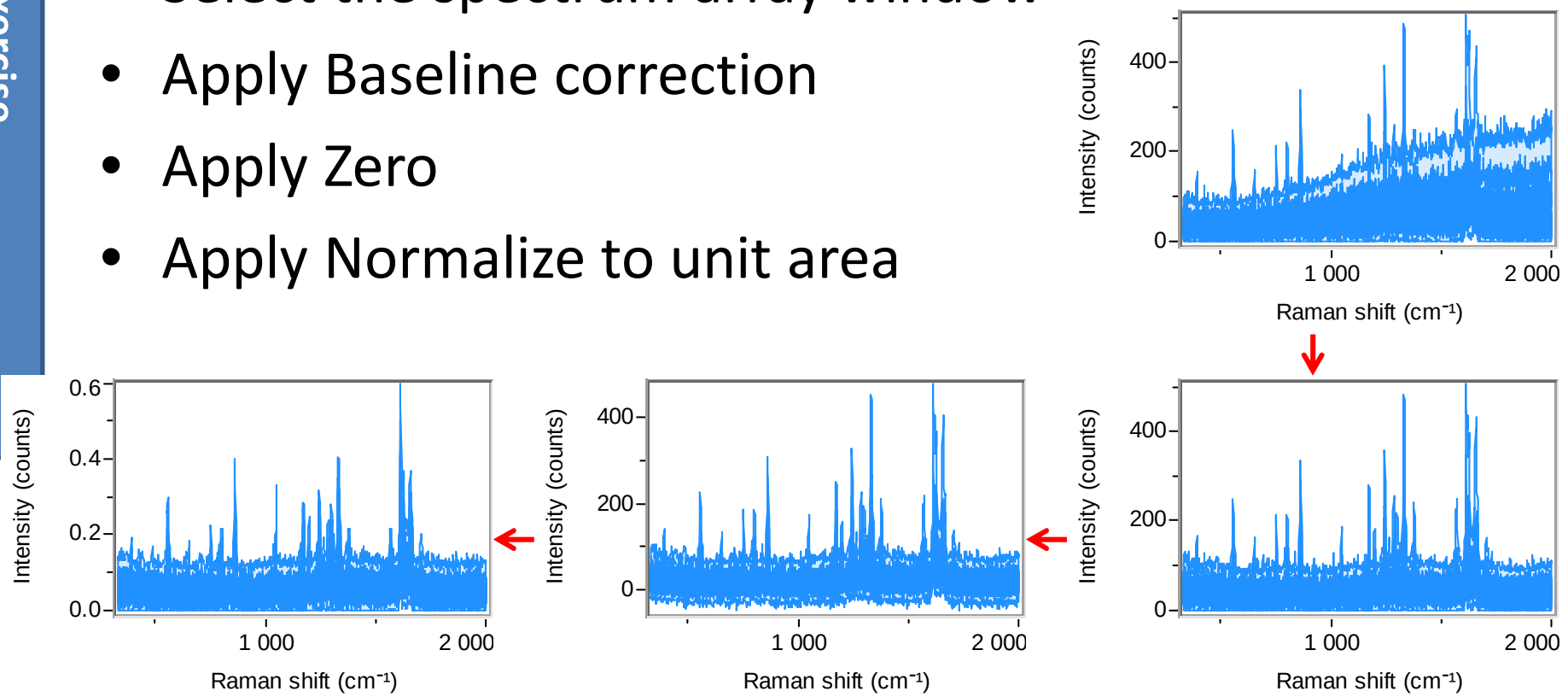
- Set Spectro (e.g. 1600)
- Set RTD time (s) (e.g. 0.5)
- Start and stop RTD 
- Review the spectral features. Adjust Spectro if necessaryy
- Set Acq time (s) (e.g. 1)
- Set Accumulation (e.g. 2)
- Unselect range; unselect AE level; turn off Autofocus; turn off DuoScan Spot
- Start map acquisition 
- Save the map 



Exercise

Process the XY-Map

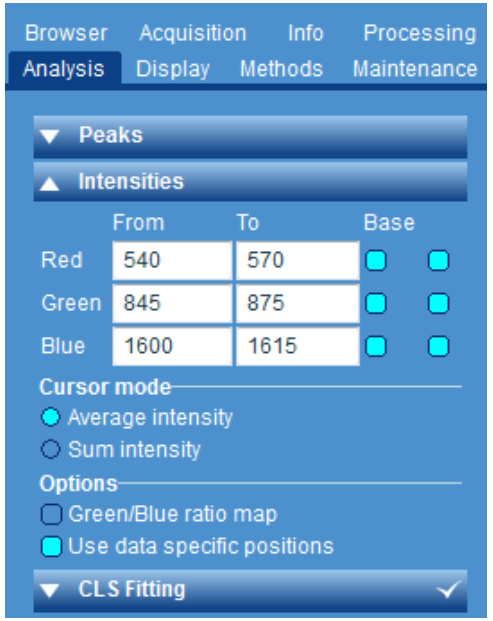
- Select a spectrum array file (e.g. Training Map)
- Select the spectrum array window
- Apply Baseline correction
- Apply Zero
- Apply Normalize to unit area

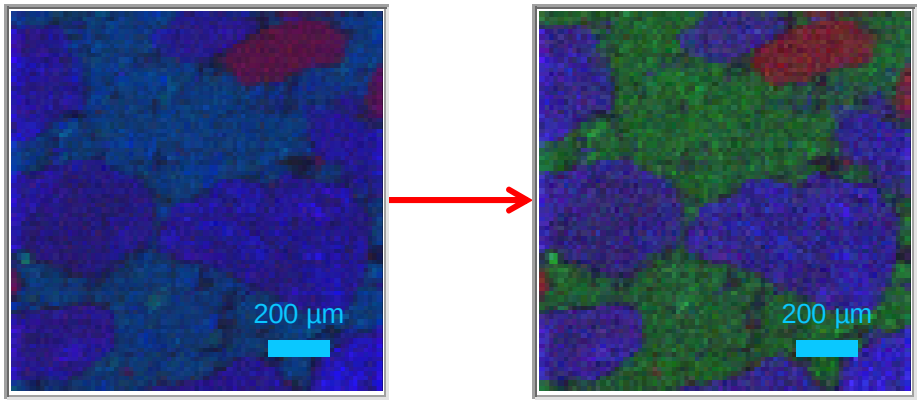


Exercise

Process the XY-Map

- Intensities
  - Select the spectrum array window
  - Select red map cursor. Double red lines become solid. Bracket the band ~ 555 cm^{-1}
  - Select green map cursor. Double green lines become solid. Bracket the band ~ 857 cm^{-1}.
  - Select blue map cursor. Double blue lines become slid. Bracket the band ~ 1608 cm^{-1}
  - Check Base for Red, Green and Blue

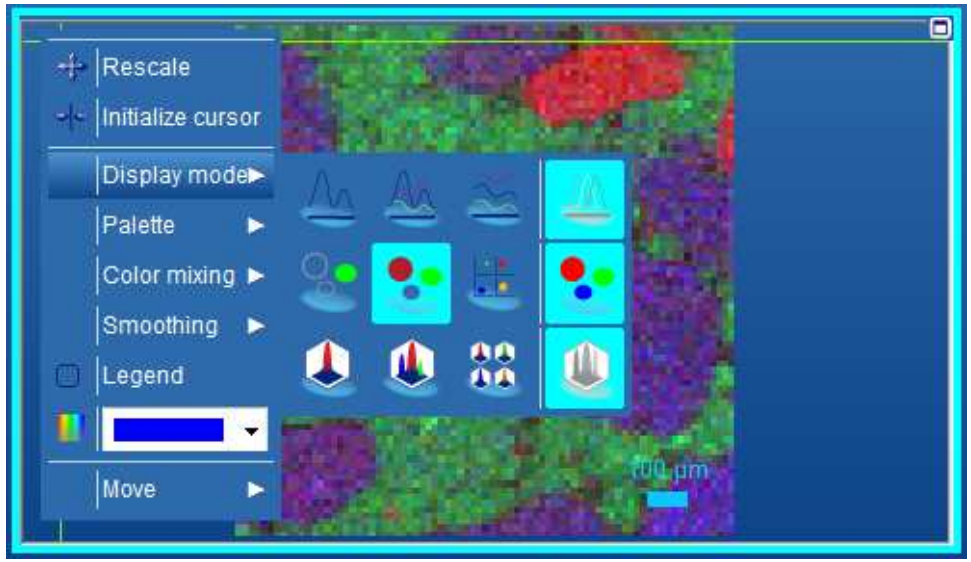


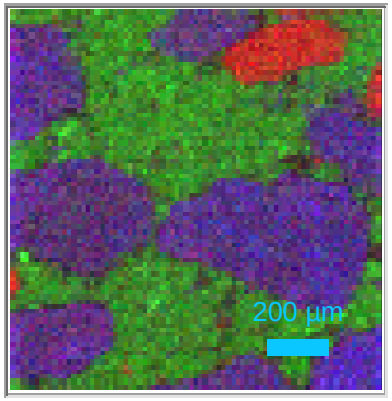


Exercise

Visualize the XY-Map

- Right click within Map window, and then bring mouse point to Display mode. Select Normalize to display all intensity maps using individual intensity scales.

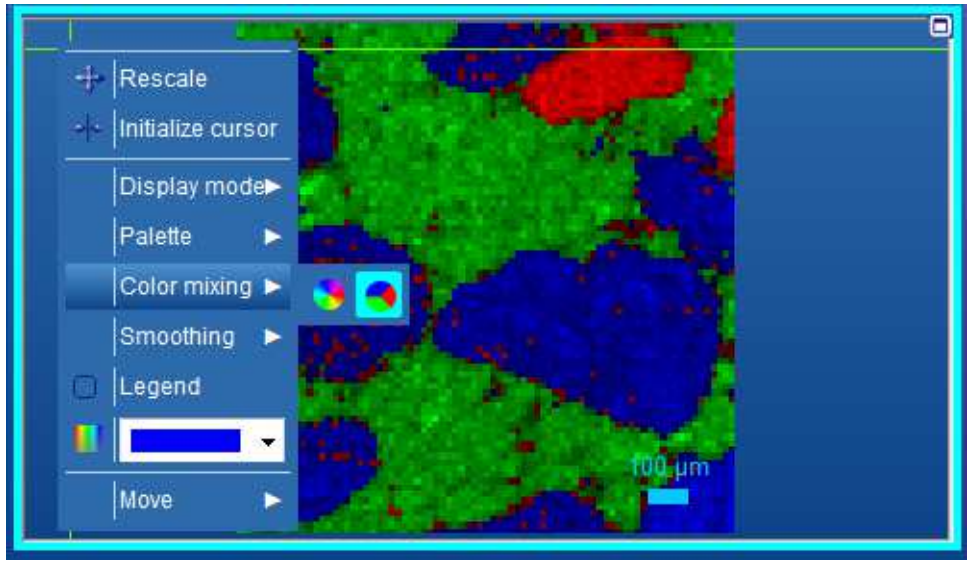


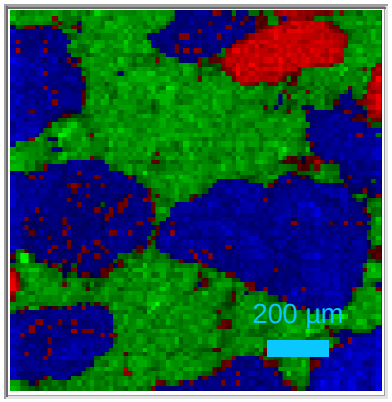


Exercise

Visualize the XY-Map

- Right click within Map window, and then bring mouse point to Color mixinge. Select Unmixed to display each pixel in the color of the highest intensity.

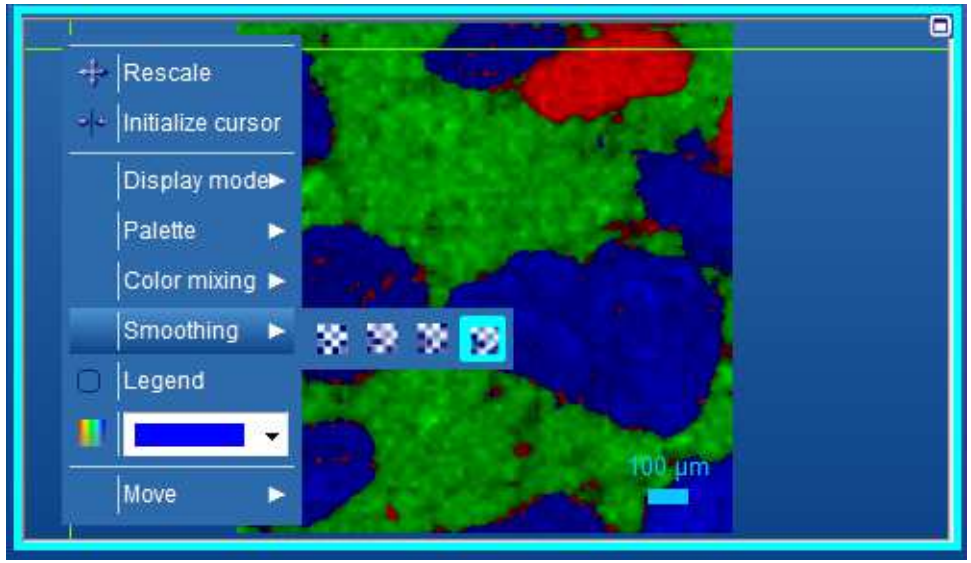


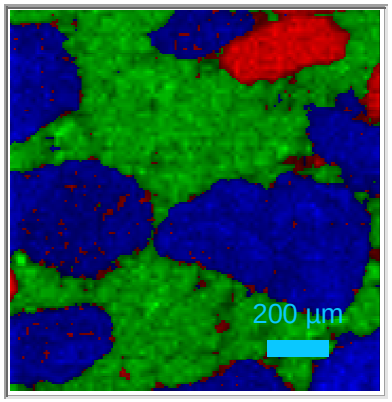


Exercise

Visualize the XY-Map

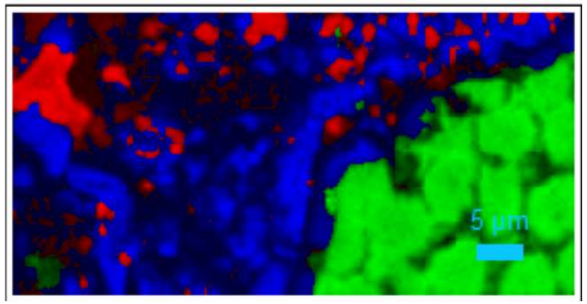
- Right click within Map window, and then bring mouse point to Smoothing. Select Smoothed to interploated display.

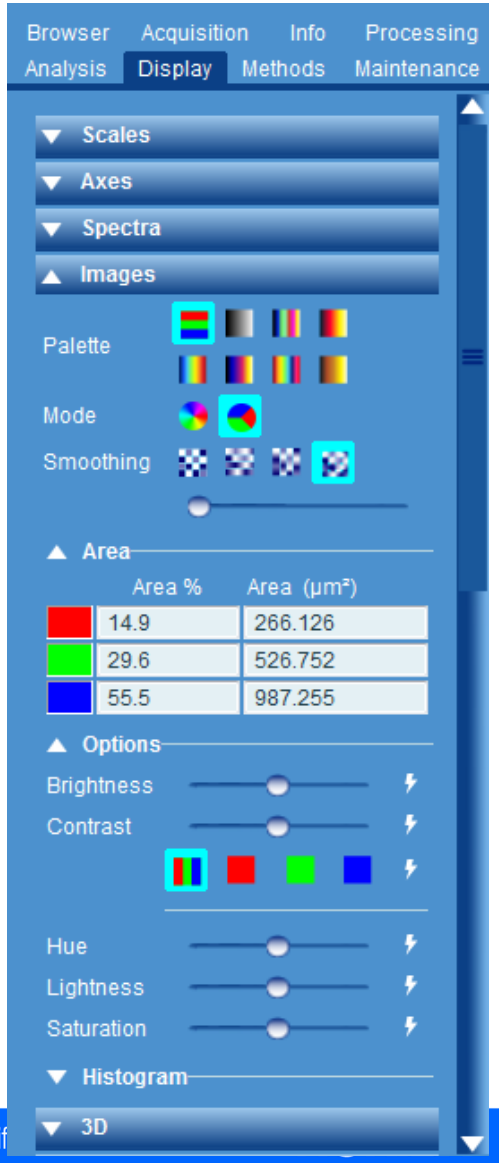




Display Section

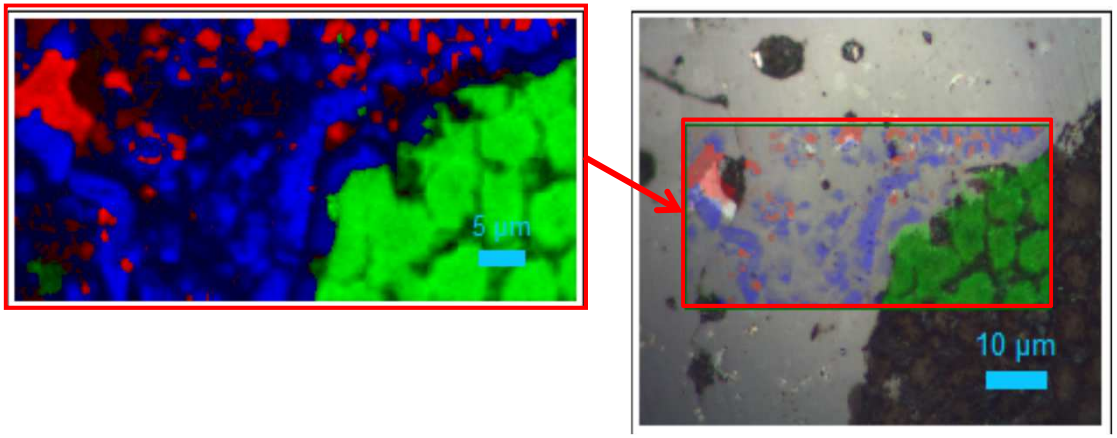
- Images
  - Adjust brightness and contrast of RGB format
  - Adjust hue, lightness and saturation of HLS format
  - For an unmixed image, calculate the area ratio of each color in RGB format

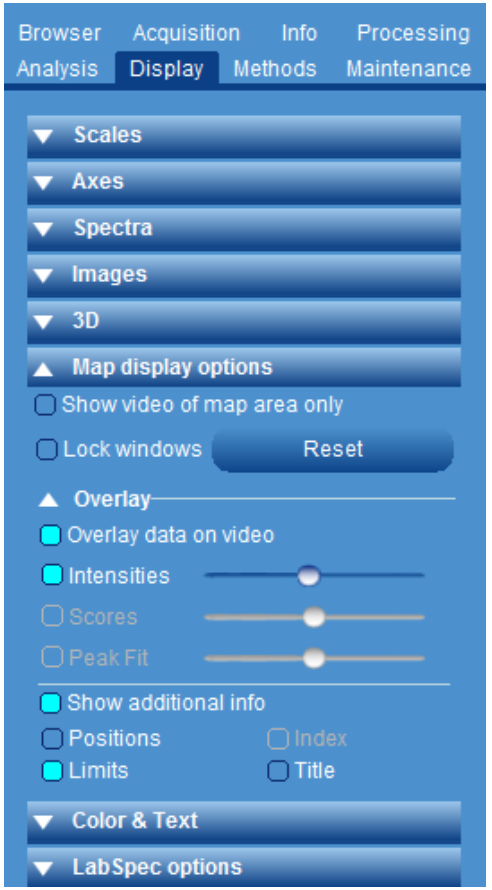




Display Section

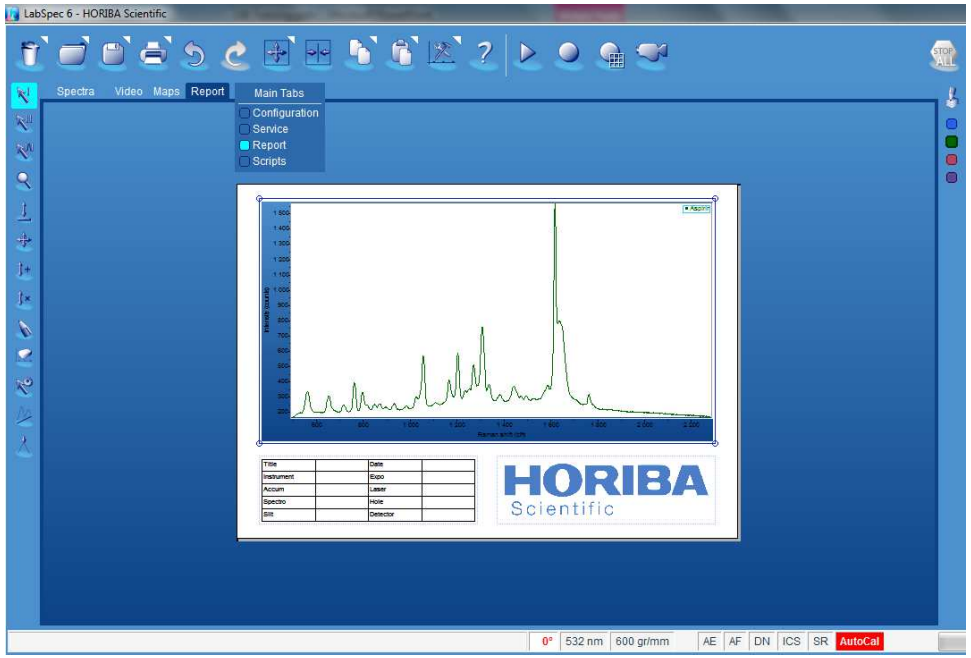
- Map display options
  - Overlay the microscopy image (e.g. brightfield image) with the chemical image (e.g. intensity map or score map)





Report Tab

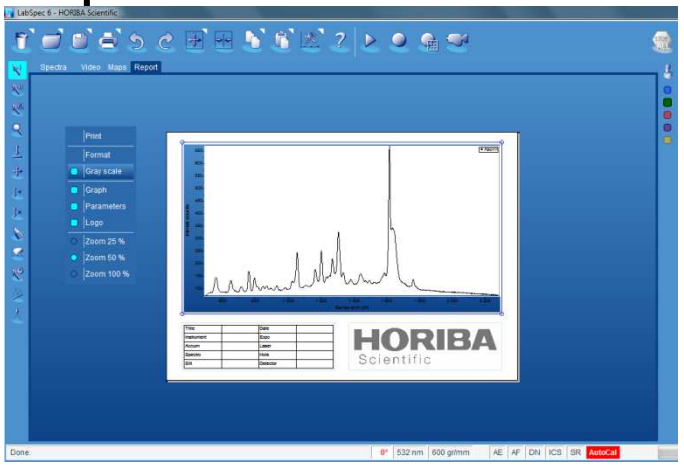
- Right click on Data tabs, and select Report
- Display data, parameters and log in one page for printing



Exercise

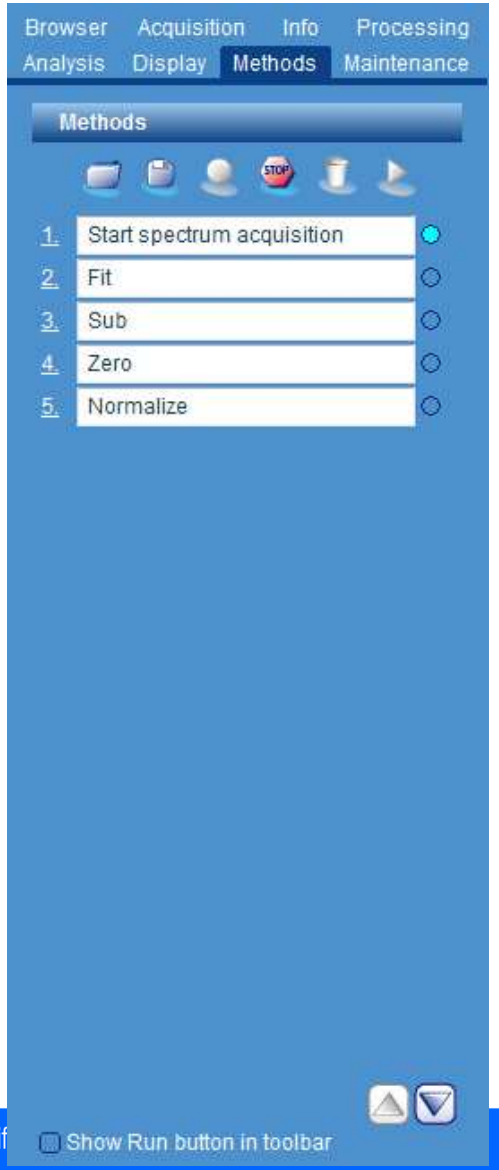
Report Tab

- Select a spectrum (e.g. Aspirin)
- Right click on Data tabs, and select Report to open Report tab.
- Right click within Report tab to activate the popup menu
- Select Zoom 50%
- Select Gray scale
- Select Print
- Right click on ata tabs, and unselect Report to close Report tab



Method Section

- Records and perform the operator selected operations in sequence.
- Method compartible operations turn M when the mouse point hovers. Click to add to Method
- Acquisition, Processing and Analysis operations are Method compatible.



Exercise

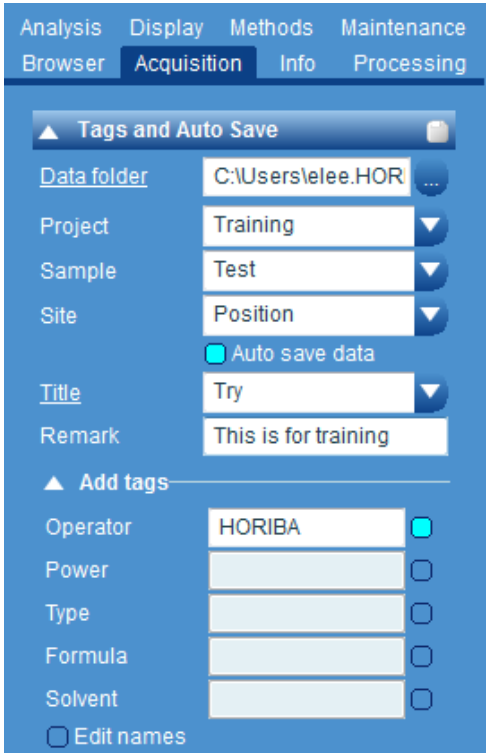
Automation

- Tale a tablet, and shave the top surface flat if necessary
- Place the sample on the stage using a microscope slide
- Select a low magnification objective lens (e.g. 10×).
  Select the matching objective lens from the software.
- Start video 
- Find the desired location and focus
- Select a high magnification objective lens (e.g. 50×).
  Select the matching objective lens from the software.
- Find the desired location and focus
- Stop video 

Exercise

Automation

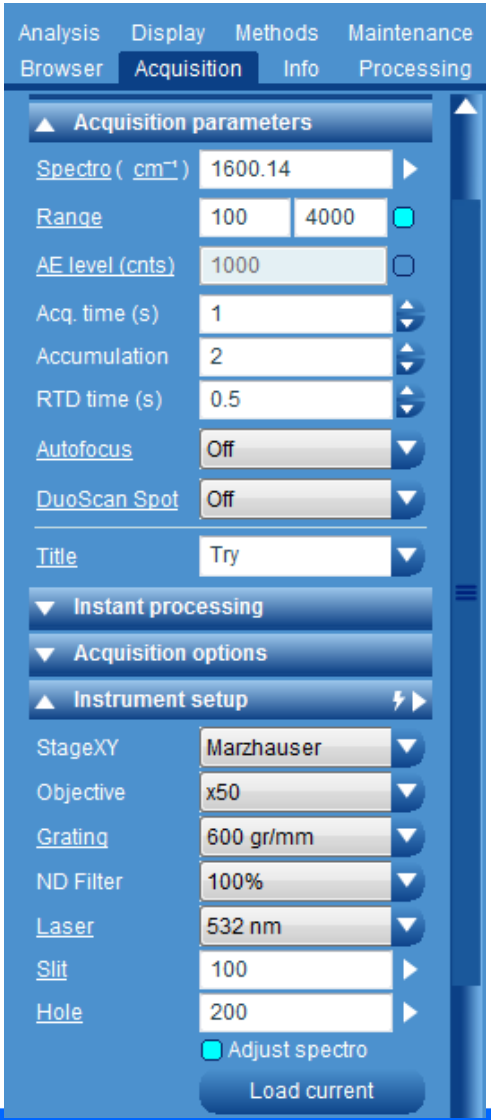
- Select Acquisition section
- Expand Tab and Auto Save
  - Select Auto Save Data
  - Data folder: Select a location on the hard drive
  - Project, Sample, Site and Title: Input appropriate texts
  - Expand Add Tags, and select Operator. Input your name



Exercise

Automation

- Expand Instrument setup
  - Objective: 50×
  - Grating: 600 gr/mm
  - Laser: 532 nm
  - Slit: 100
  - Hole: 200
  - ND filter: 100 %
- Expand Acquisition parameters
  - Spectro: 1600
  - Range: Select, and input 100 and 4000
  - AE level: Unselect
  - Acq. time: 1
  - Accumulation: 2
  - Autofocus: off



Exercise

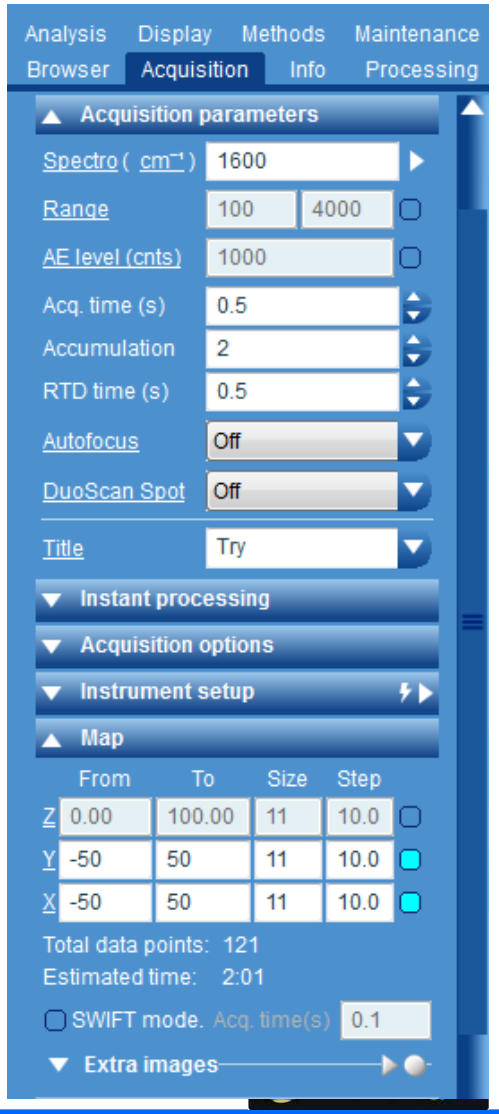
Automation

- Select Methods section
  - Select Record Method
  - From Icon Bar, click Start Spectrum Acquisition
  - From Processing section, click Fit and then Sub in Baseline correction
  - From Processing section, click Zero and then Normalize in Correction
  - Select Stop method recording

Automation

Exercise

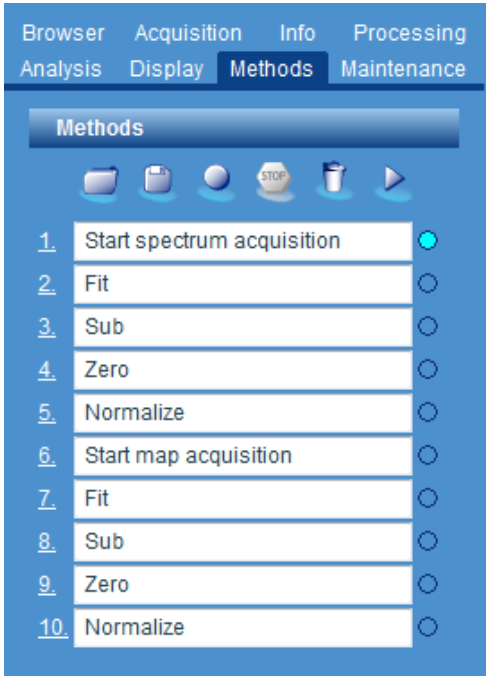
- Expand Acquisition parameters
  - Spectro: 1600
  - Range: Unselect
  - AE level: Unselect
  - Acq. time: 0.5
  - Accumulation: 2
  - Autofocus: off
  - DuoScan Spot: off
- Expand Map
  - Select Y; From = -50; To = 50; Size = 11; Step = 10 (automatically set)
  - Select X; From = -50; To = 50; Size = 11; Step = 10 (automatically set)



Exercise

Automation

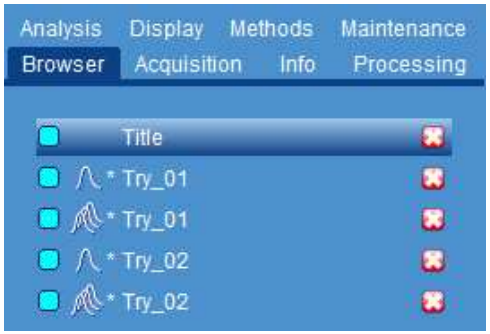
- Select Methods section
  - Select Record Method
  - From Icon Bar, click Start Map Acquisition
  - From Processing section, click Fit and then Sub in Baseline correction
  - From Processing section, click Zero and then Normalize in Correction
  - Select Stop method recording

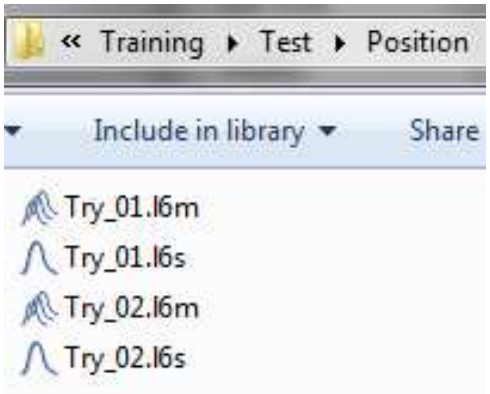


Exercise

Automation

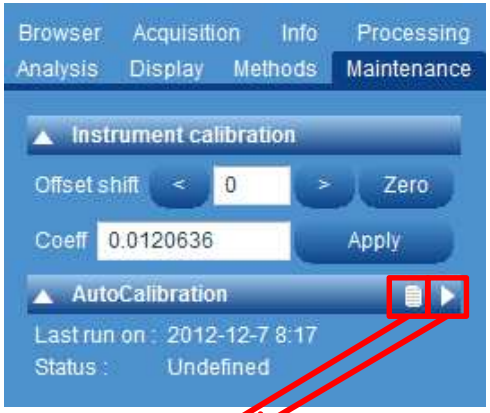
- Select Methods section
  - Select Run method
  - After completion of the first run, select Run method one more time
- Results
  - Select Spectra tab, and confirm two spectra (Try_01 and Try_02) are recorded
  - Select Map tab, and confirm two maps (Try_01 and Try_02) are recorded
  - Open Data Folder location. Confirm subdirectories are created, and data files saved

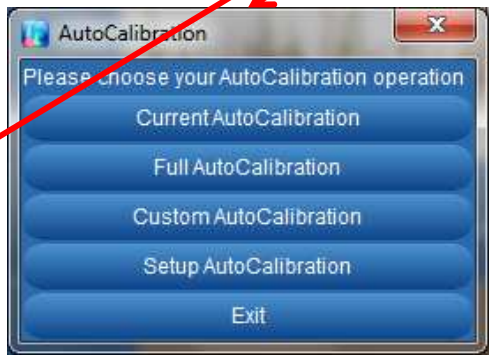


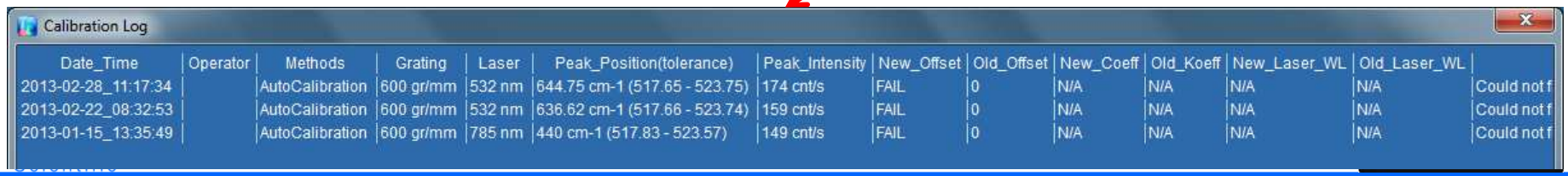


Maintenance Section

- AutoCalibration
  - Use Si standard provided by HORIBA with the system.
  - Click AutoCal button in the status bar or Run button in AutoCalibration module
  - Setup AutoCalibration: Available only to administrator level operators.
  - Current AutoCalibration: Current laser + current grating
  - Full AutoCalibration: All lasers + all gratings
  - Show log: Display AutoCalibration log

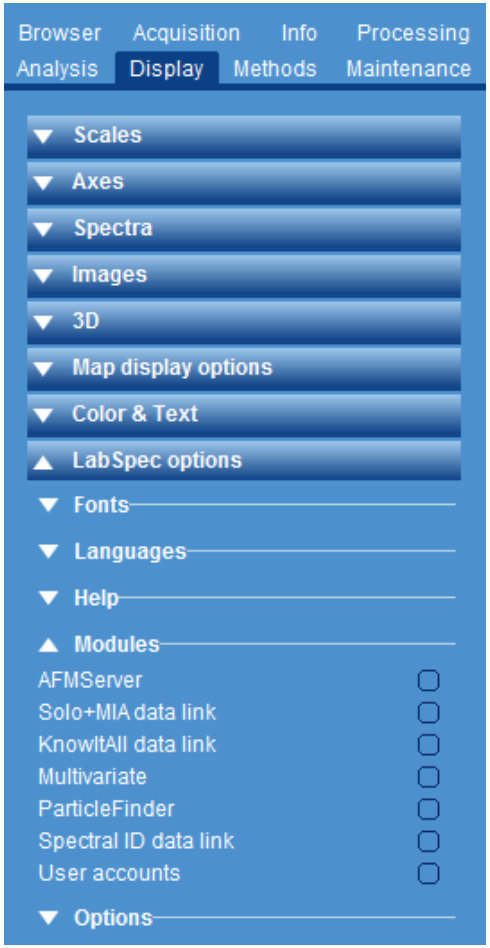






Display Section

- LabSpec options
  - Available only to administrator level operators
  - Activate/deactivate advanced/optional functionality



User Accounts

- Administrator only
  - Manage user accounts
  - Full access to Processing and Analysis sections
  - Full acess to Display section including custome module management
  - Setup AutoCalibration
  - Acess to Service and Configuration functions
- Expert and higher
  - Full acess to Acquistion
  - Access to advanced functions in Processing and Analysis sections
  - Access to Display section except for custome module management
  - VBS scripting for advanced customization

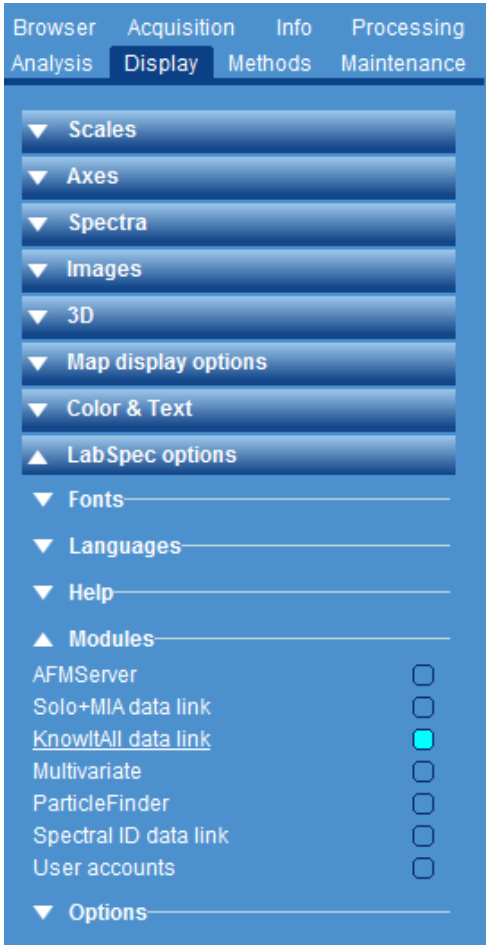
User Accounts

- Operator (full) and higher
  - Acquire spectrum arrays
  - Access to Processing and Analysis functions for spectrum arrays
  - Access to Image and Map display parameters in Display section
- Operator (basic) and higher
  - Acquire spectra and microscope images
  - Access to Processing and Analysis functions for spectra
  - Access to Spectrum disply parameters in Display section
  - Perform AutoCalibration, and view AutoCalibration log file

LabSpec 6 - Optional

KnowItAll

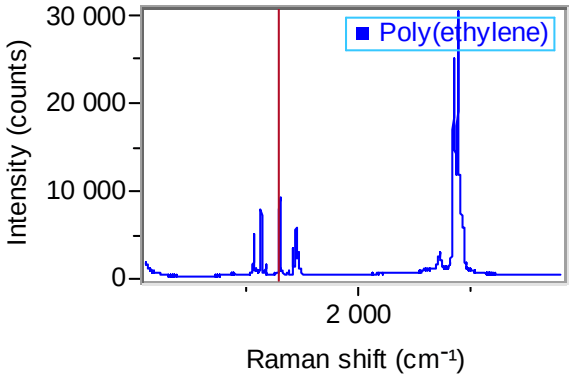
- An optional module for LS 6
- Available in LS 6.1 and higher
- Library search engine by BioRad
- After installation of KnowItAll (KIA), direct link from LS 6 to KIA is  activated from LabSpec options module in Display section. The procedure requires a separate license.

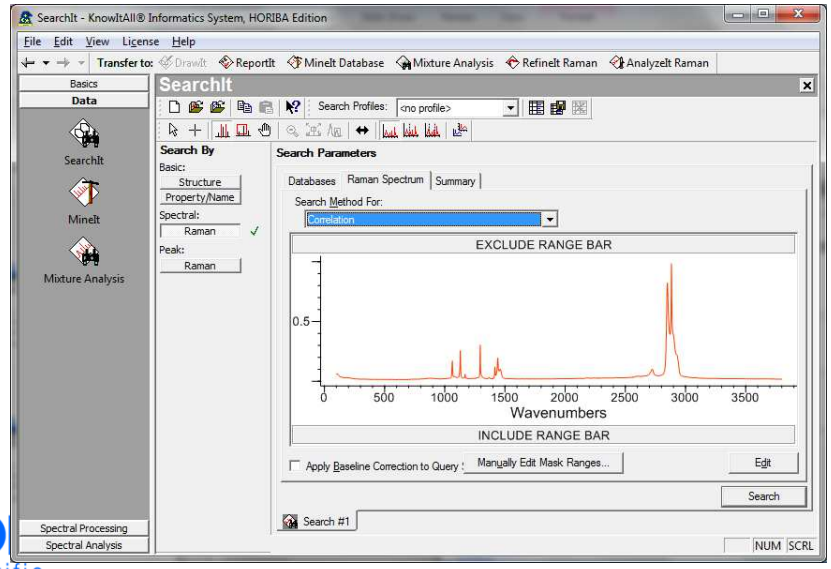


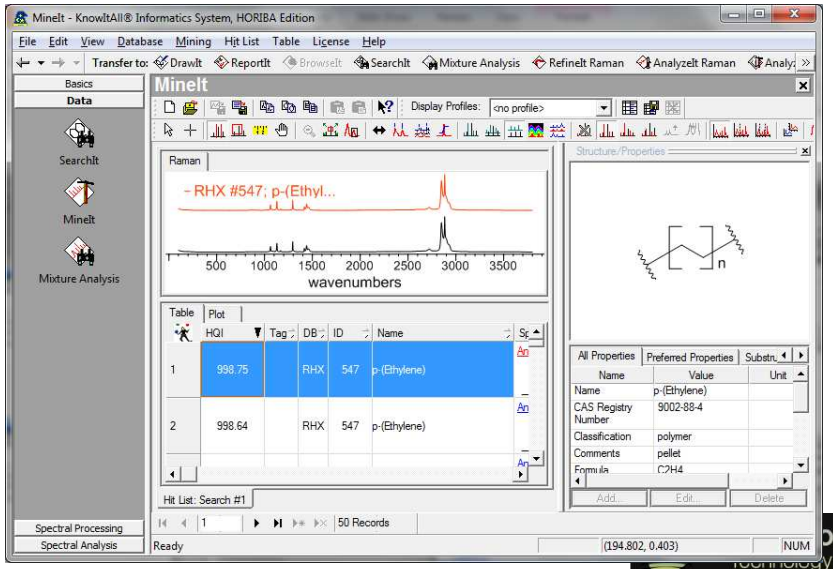
Exercise

Search Library

- Select a spectrum (e.g. polyethylene)
- Click the link to KIA 
- KIA opens with the spectrum imported, and ready to search.
- Click Search. The first hit/best fit is polyethylene



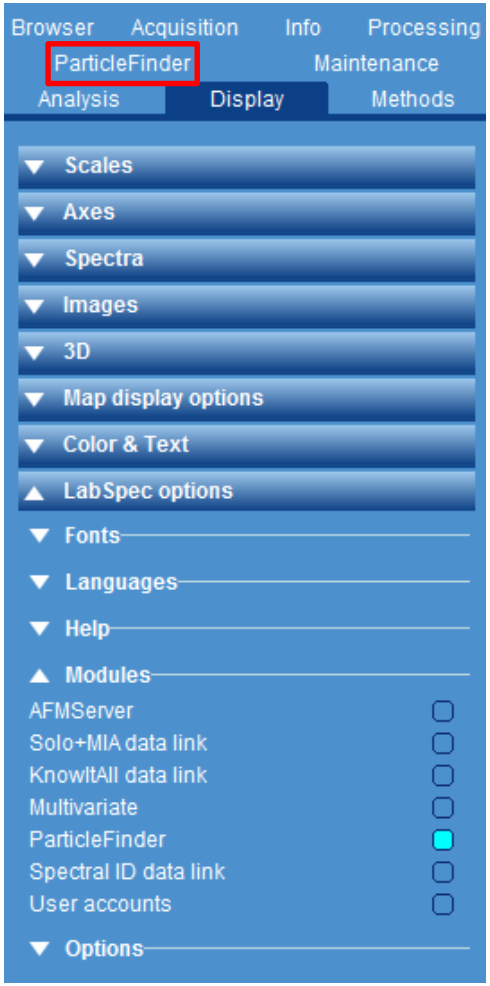




LabSpec 6 - Optional

Particle Finder

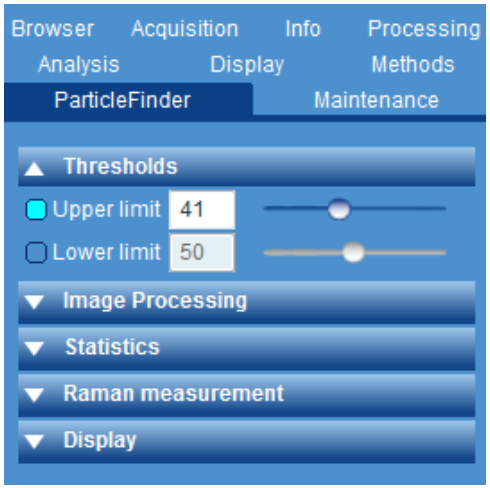
- An optional module for LS 6
- Available in LS 6.2 and higher
- Analyze the sample image to identify, and analyze particles. Morphological and Raman analyses.
- After installation, Particle Finder section is activated from LabSpec options module in Display section. The procedure requires a separate license.

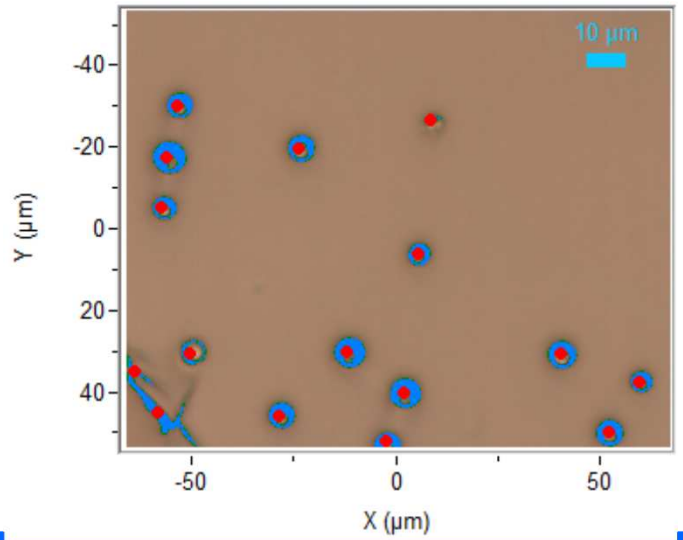


Exercise

Particle Finder

- Open an image (e.g. Training Image)
- Select ParticleFinder section
- Expand threshold
  - Select Upper limit. Threshold is applied interactively
  - Adjust the threshold to your satisfaction (e.g. 41)

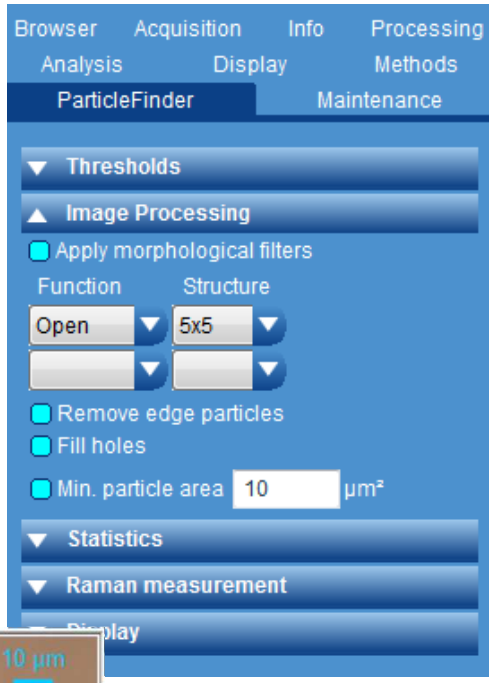


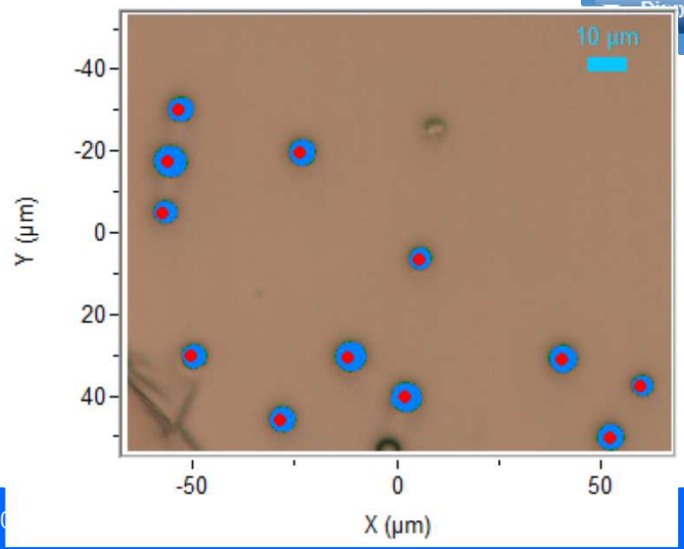


Exercise

Particle Finder

- Expand Image Processing
  - Select Apply morphological filters.
  - Select a filter (e.g. Open) or filters from Function
  - Select Remove edge particles and Fill holes
  - Select Min. particle area, and input the threshold (e.g. 10)

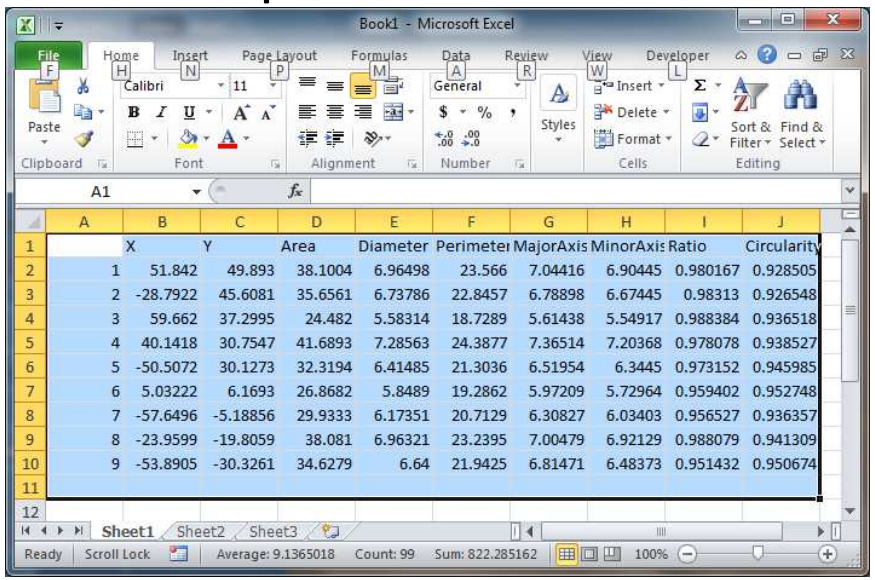




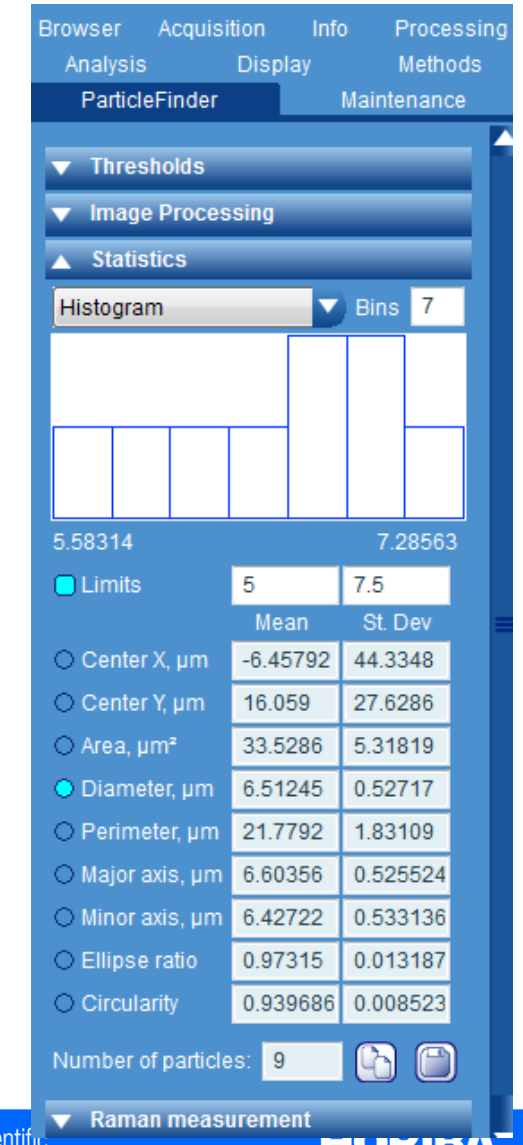
Exercise

Particle Finder

- Expand statistics
  - Further select particles based on the morphological characteristics (e.g. 5 µm < Diameter < 7.5 µm)
  - Select Copy button to copy full statistics
  - Open Excel and paste



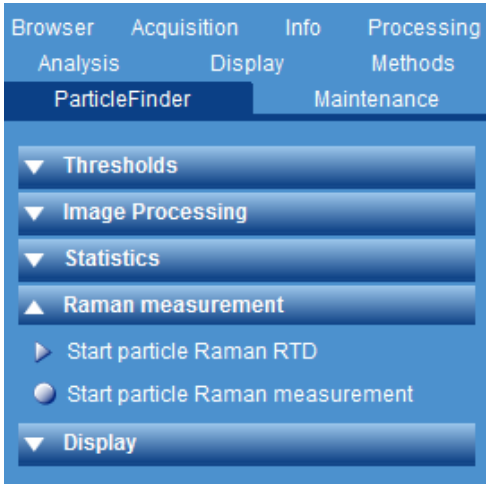
	A	B	C	D	E	F	G	H	I	J
1		X	Y	Area	Diameter	Perimeter	MajorAxis	MinorAxis	Ratio	Circularity
2	1	51.842	49.893	38.1004	6.96498	23.566	7.04416	6.90445	0.980167	0.928505
3	2	-28.7922	45.6081	35.6561	6.73786	22.8457	6.78898	6.67445	0.98313	0.926548
4	3	59.662	37.2995	24.482	5.58314	18.7289	5.61438	5.54917	0.988384	0.936518
5	4	40.1418	30.7547	41.6893	7.28563	24.3877	7.36514	7.20368	0.978078	0.938527
6	5	-50.5072	30.1273	32.3194	6.41485	21.3036	6.51954	6.3445	0.973152	0.945985
7	6	5.03222	6.1693	26.8682	5.8489	19.2862	5.97209	5.72964	0.959402	0.952748
8	7	-57.6496	-5.18856	29.9333	6.17351	20.7129	6.30827	6.03403	0.956527	0.936357
9	8	-23.9599	-19.8059	38.081	6.96321	23.2395	7.00479	6.92129	0.988079	0.941309
10	9	-53.8905	-30.3261	34.6279	6.64	21.9425	6.81471	6.48373	0.951432	0.950674
11										
12										



Exercise

Particle Finder

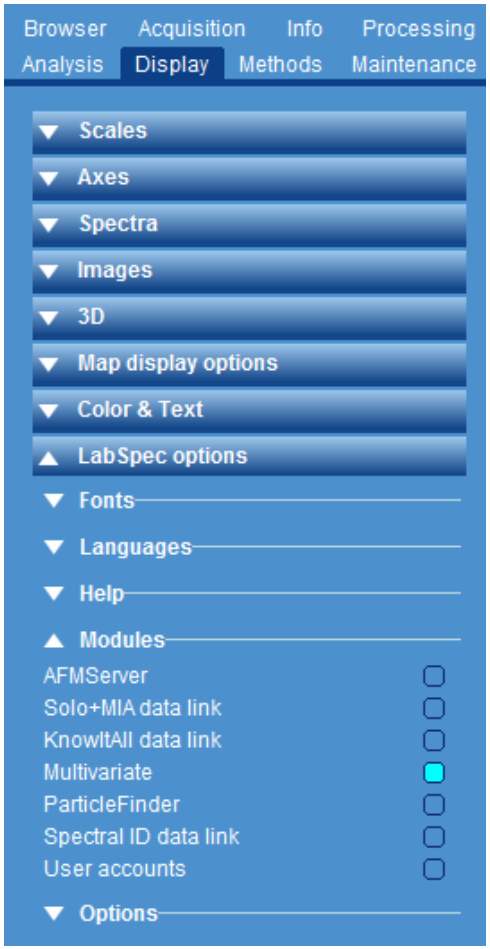
- Expand Raman measurement
  - Click Start particle Raman measurement
  - Stage moves to center each particle in turn, and record a spectrum from the red dotted position
  - The result is a map as a collection of all particle spectra



LabSpec 6 - Optional

Multivariate Analysis

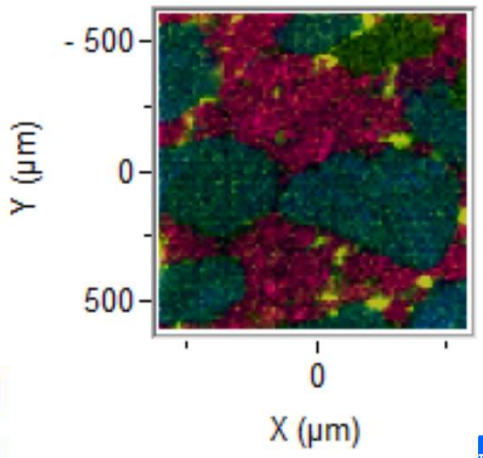
- An optional analysis methods for LS 6
- Selected methods are available in LS 6.2 with more in deveopment
- Multivariate analysis (MVA) engine by Eigenvector Research
- After installation, MVA methods are activated from LabSpec options module in Display section. The procedure requires a separate license.
- MVA methods are added to Analysis section.

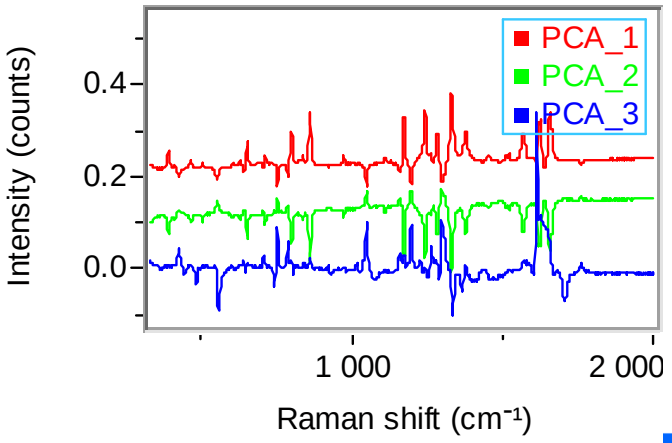


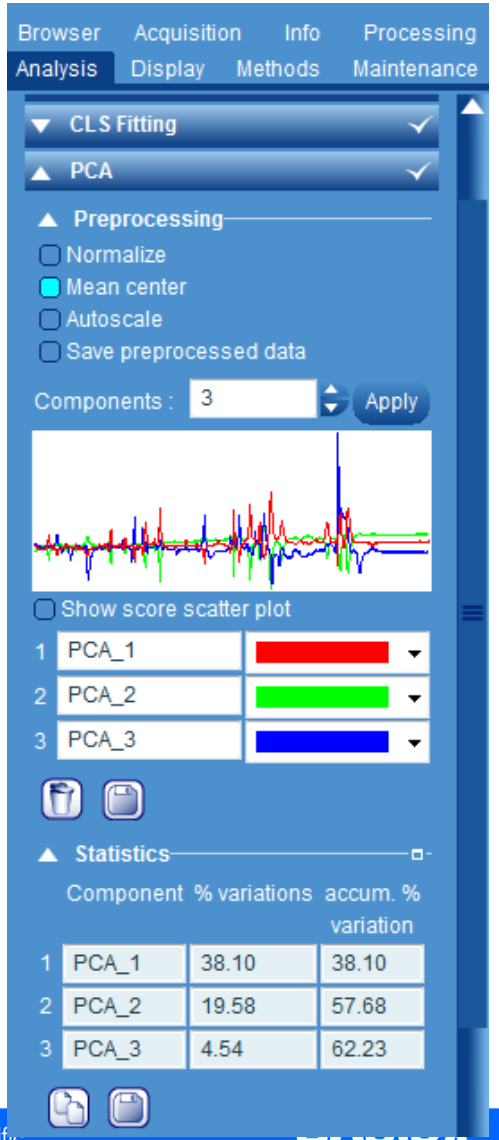
Exercise

Multivariate Analysis

- Select a map (e.g. Training Map)
  - Select Spectrum Array window
- From Analysis section, expand PCA
  - Expand Preprocessing, and select Mean center
  - Set Components to 3
  - Click Apply



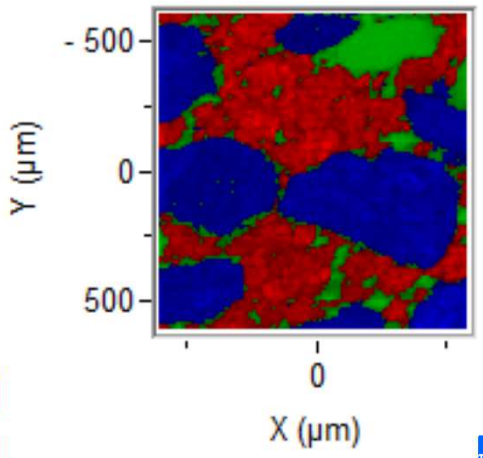


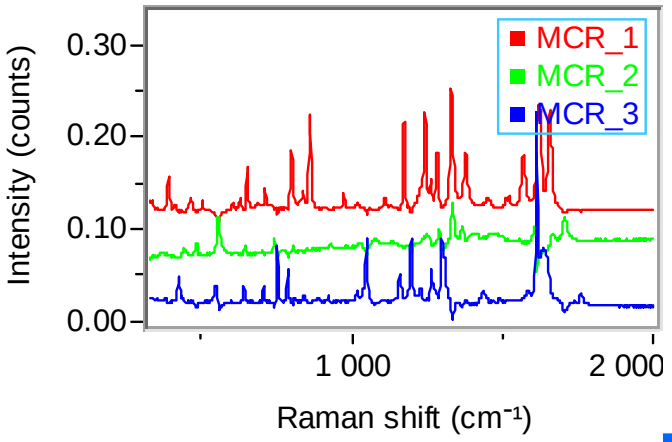


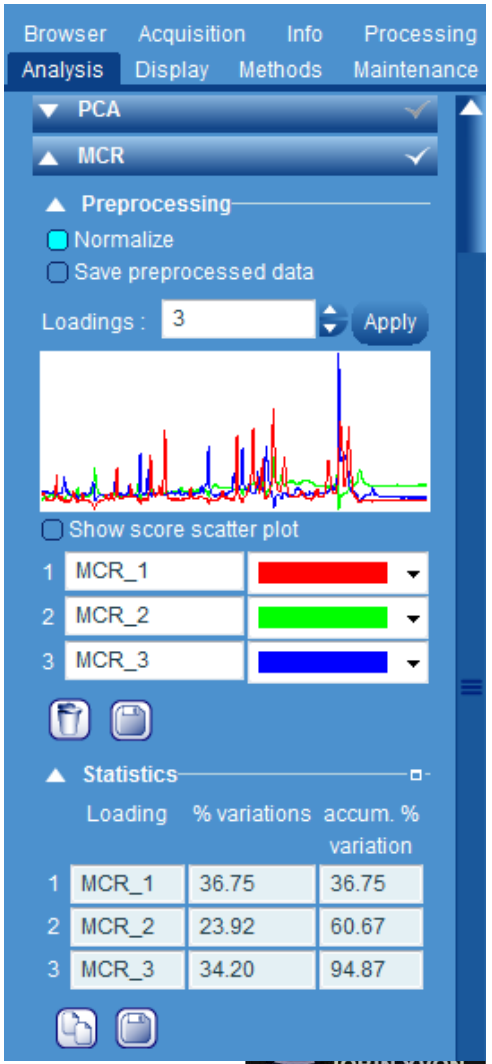
Exercise

Multivariate Analysis

- Select a map (e.g. Training Map)
  - Select Spectrum Array window
- From Analysis section, expand MCR
  - Expand Preprocessing, and select Normalize
  - Set Components to 3
  - Click Apply







Multivariate Analysis

Exercise

- Select a map (e.g. Training Map)
  - Select Spectrum Array window
- From Analysis section, expand DCA
  - Expand Preprocessing, and select Normalize
  - Set Components to 3
  - Click Apply