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TM018 - Viewing and saving image data   WiRE™ 5

This document aims to show the WiRE™ 5 user how to import spectral data of different formats into WiRE. It also discusses the different viewing and saving options for mapping data. It assumes that the WiRE™ 5 software has been installed correctly with the associated passwords and that the inVia instrument has an encoded microscope mapping stage.
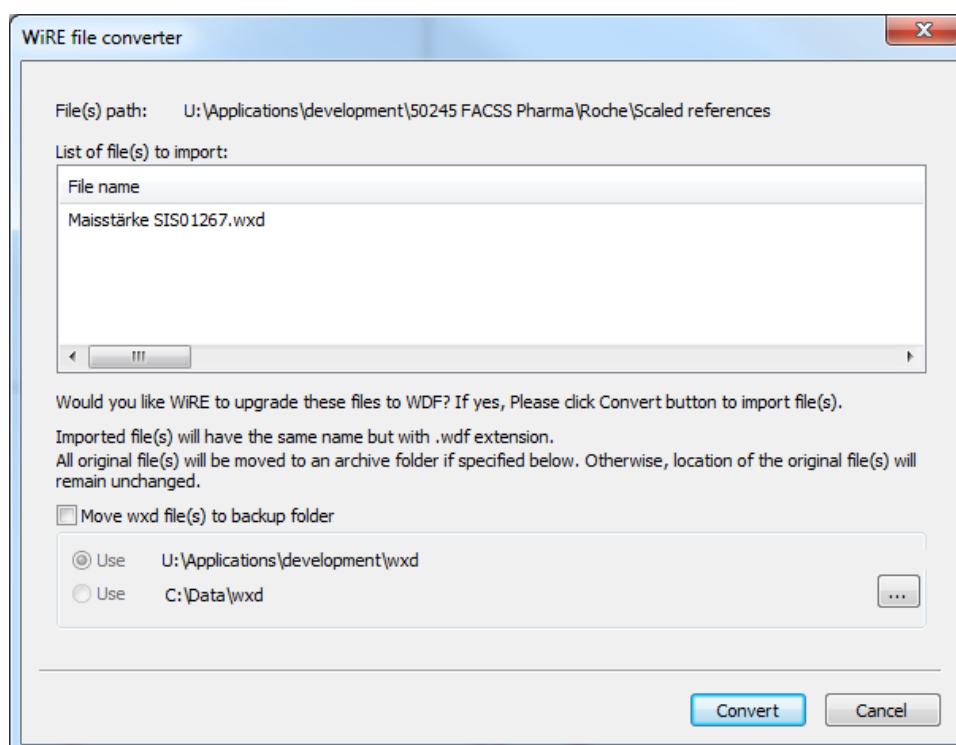
Importing data into WiRE

WiRE uses a 'wdf' file format which enables fast access, processing, analysis and saving of data, whilst still providing a highly compact file structure.

WiRE can import the following formats:

- 'wxd' (single spectra and mapping files)
- 'spc'
- 'txt'

These formats are converted to 'wdf' during the import process. All data within WiRE is therefore of 'wdf' format.

During import, options are provided to automatically archive the original file.

Tick the 'Move file(s) to backup folder' option. This will move the original data to a new folder within the selected folder location.

Large 'wxd' files will take longer to convert, but only need converting once.

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Saving spectra from WiRE

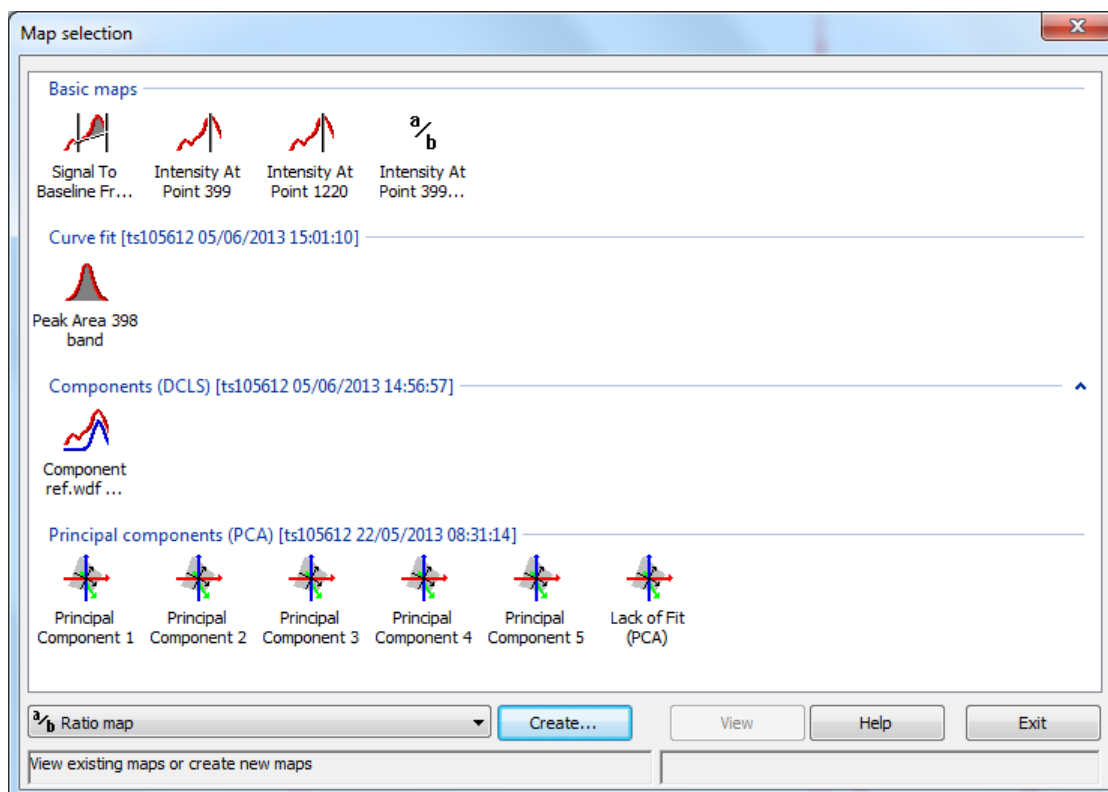Single spectra and entire mapping files can be saved as:

- 'wdf'
- 'spc'
- 'txt'

Where possible it is recommended that the 'wdf' format is used as this contains all measurement parameter and instrument state information. The 'wdf' format has been specifically designed to make data opening, saving, processing and analysis fast, while minimizing the file size. Previous WiRE 3 versions and earlier can open 'spc' and 'txt' formats. 'wdf' files can be directly imported into Matlab.
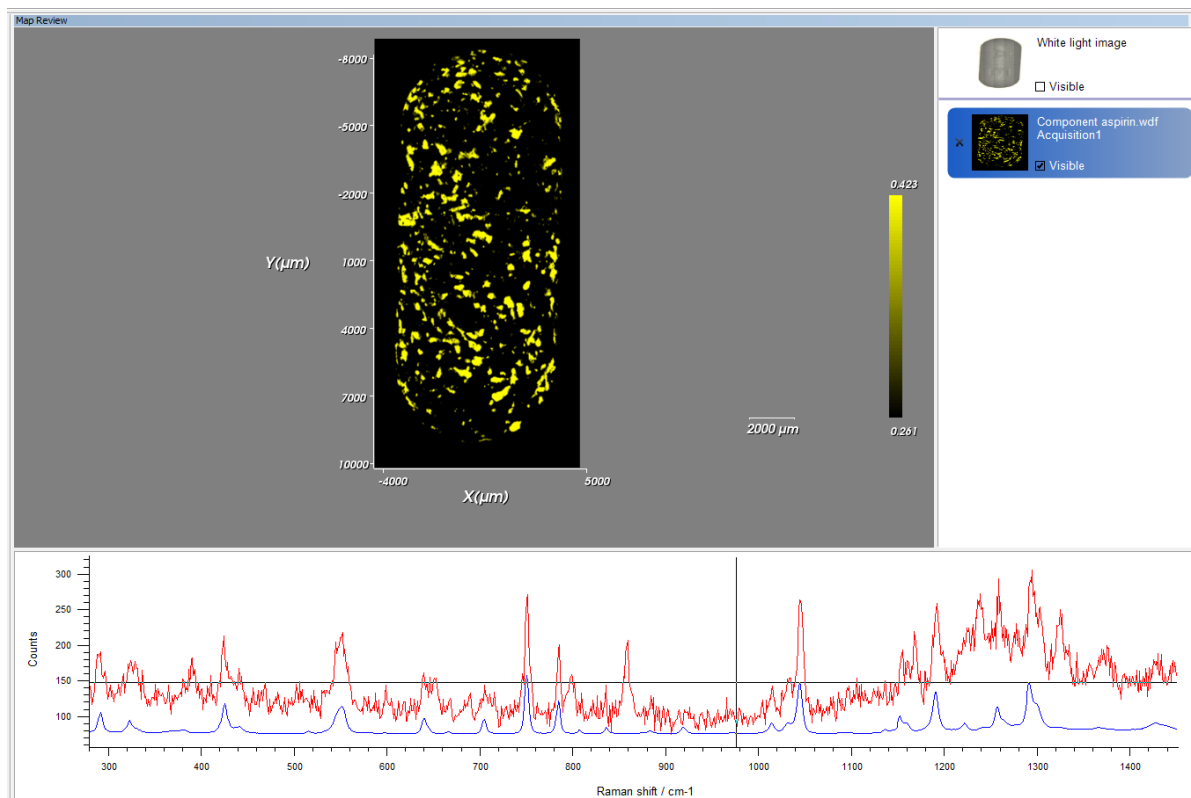
Viewing mapping data

Viewing images generated from mapping data

1. From the 'Map selection' dialogue, click on the desired image or images.

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2. Click on **View**.

The 'Map Review' window appears with the Raman image superimposed on the white light image, when viewed for the first time.
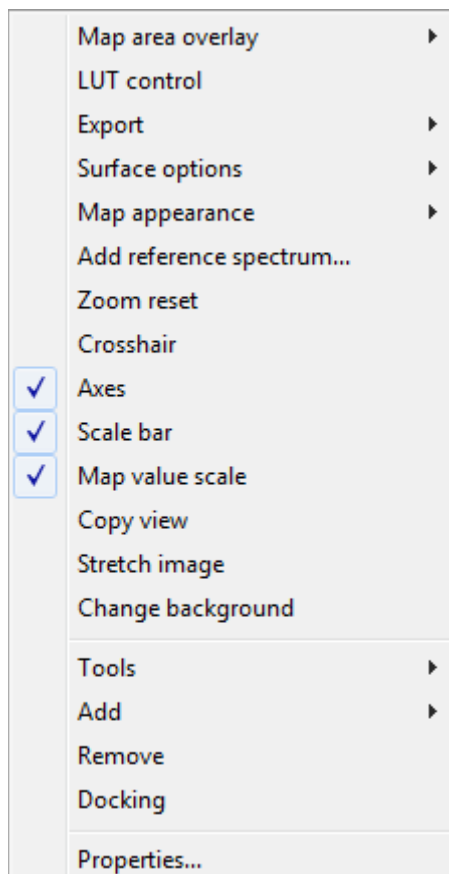

Map review shows:

- Image(s) available for viewing, including image colour and 'active' image (top right)
- Image(s) currently viewed (top left)
- 'Active' spectrum from collected data in red (bottom)

Note, when viewing component (DCLS) images, the 'reference' spectrum used is shown in blue as indicated above.

The images available for viewing can be hidden by moving the grey bar, which borders the left edge of the sub-window.

The currently viewed image(s) can be zoomed in and out by scrolling the mouse wheel. The image(s) can be displaced by holding down the mouse wheel and moving the mouse.

The image can be scaled to the map review by right clicking and selecting **Zoom reset**.

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The right click menu also allows the following items to be added to the image(s):
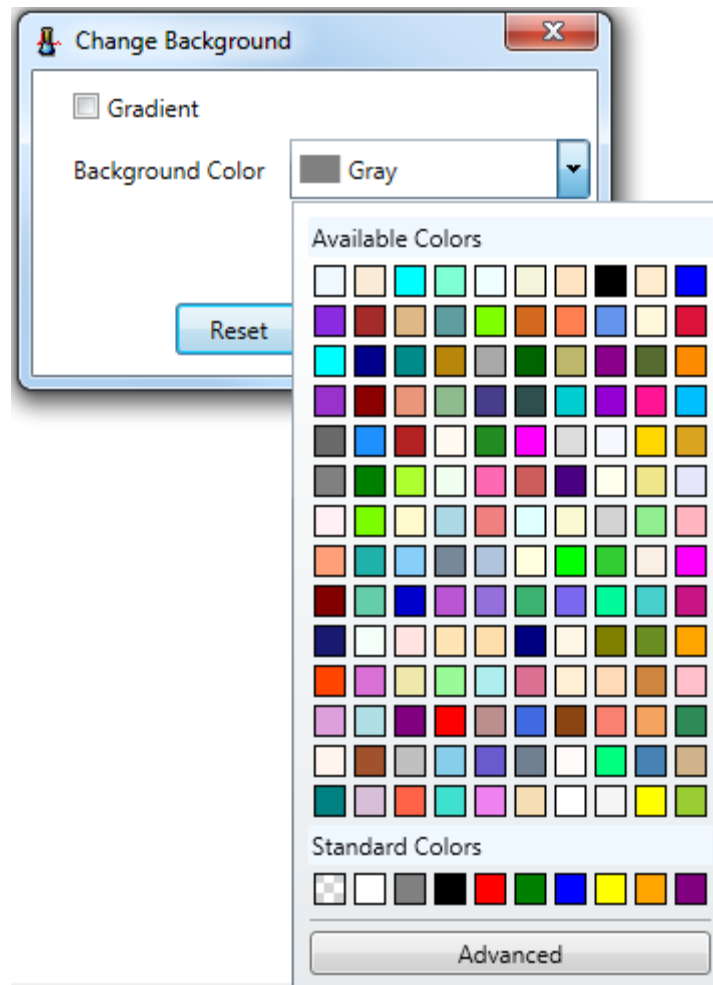
- Map area overlay (map outline/grid)
- Crosshairs
- Axes
- Scale bar
- Map value scale (places a colour value scale bar next to the Raman image)

The look up table (LUT), a convenient interface to change the Raman image colour, brightness, and contrast, can be opened by selecting **LUT control**. Refer to the LUT section within this document for more details.
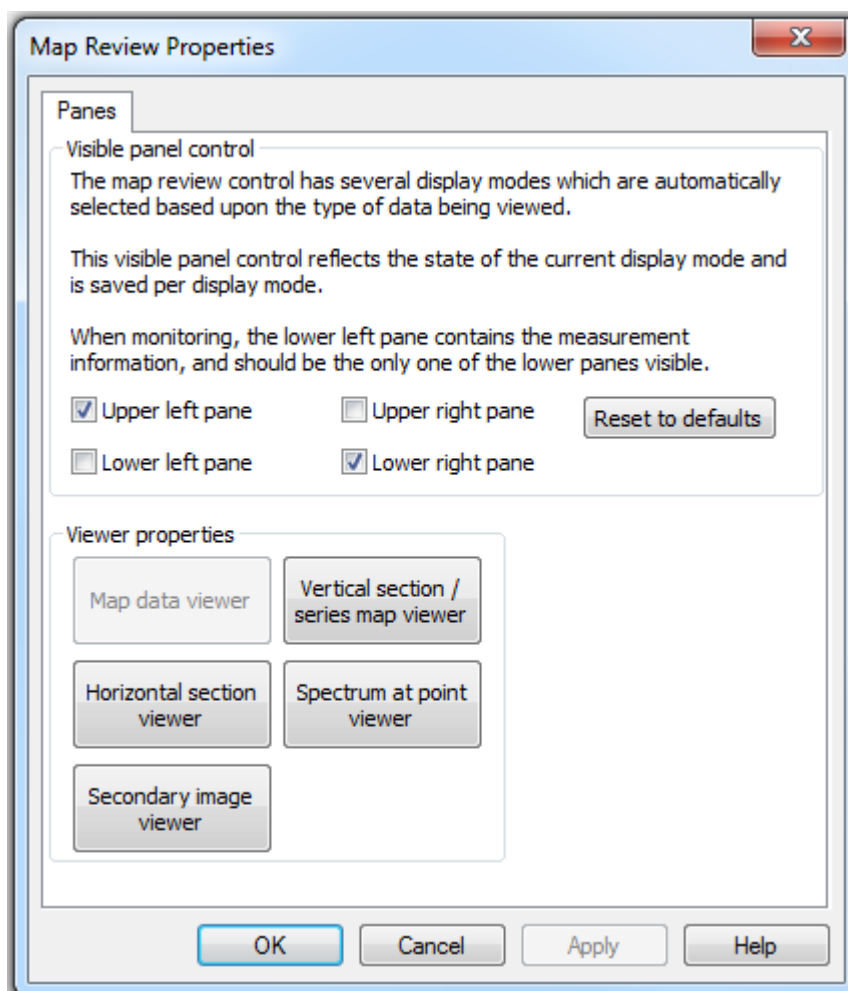
The **Map appearance** option enables image interpolation to be turned on or off.

Selecting **Stretch image** changes the aspect ratio of the image such that the image expands to fill the map review window.

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The background colour of map review can be changed by selecting **Change background**.

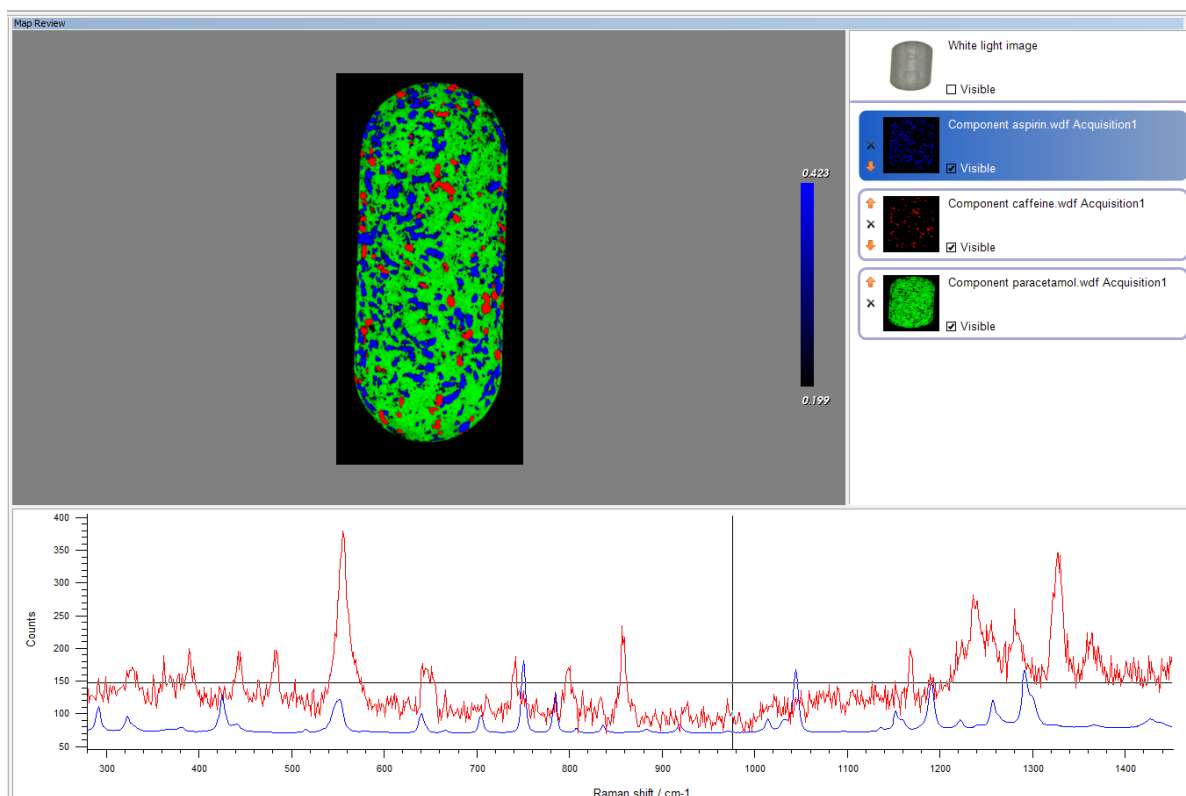The **Properties** option is located at the bottom of the context menu.

Vertical (upper right pane) and horizontal (lower left pane) cross-section traces can be added to the view by ticking the appropriate box. The profiles are determined by the location of the crosshair on the Raman image and show the variation in LUT value in the X or Y plane only.

Viewing multiple images

1. Select images to be viewed from map selection dialogue.

- Use the 'Ctrl' keyboard button to select the images
- Use the mouse cursor to draw around a group
- Click on the group title to select the entire group

2. Click on **View**.

Now multiple images are available for viewing in the top left thumbnail pane.

Use the 'visible' tick box to display desired images. Remember that the images are layered and the top image in the thumbnail list is the top image in the layer. The layer order can be adjusted using the orange arrows. The cross will remove the image from map review.

Each image has its own LUT control, which is selected by clicking on the relevant thumbnail (the active image is highlighted in blue). Each image LUT can be made transparent independently.

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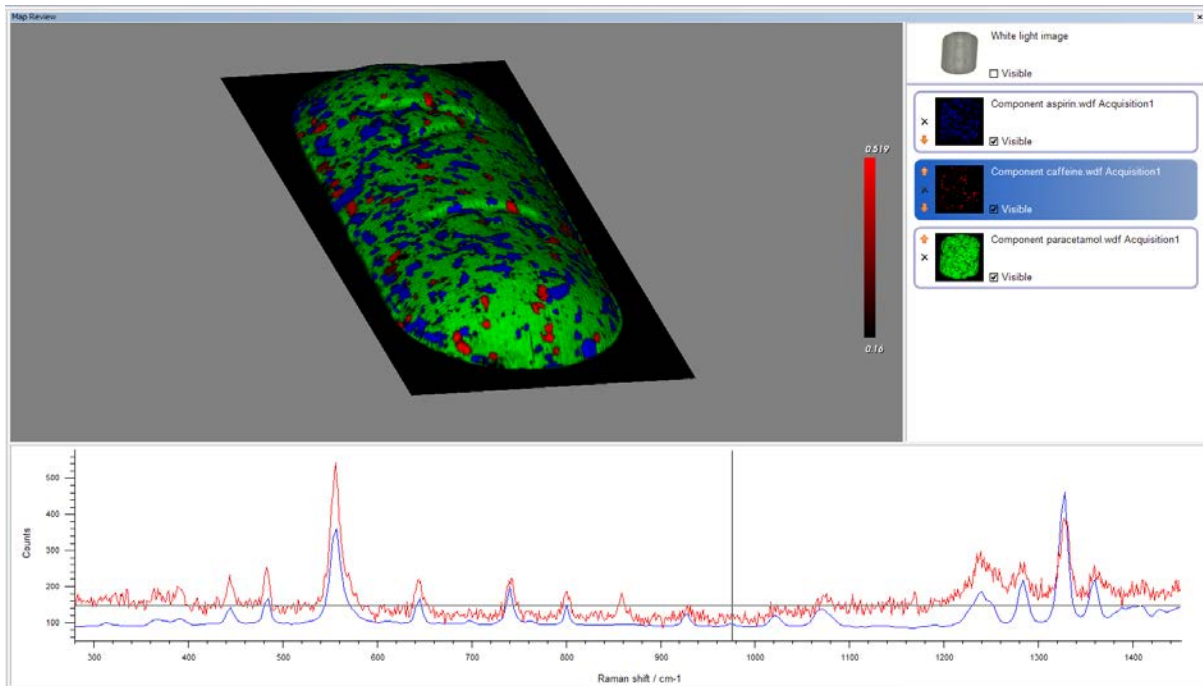**apply innovation™**

<u>Viewing images in 3D</u>

Images can be viewed in 3D either in map review (if LiveTrack has been used for the measurement) or image data viewer.

Right clicking on an image in map review enables Surface options to be expanded. These options include **2D view** or overlaying the displayed Raman image onto a 3D surface. This surface could either be obtained using height data from LiveTrack measurements (by selecting **Use Livetrack data**), or could be generated from any other analysis performed on the same dataset (by selecting **Choose map for Z…**).

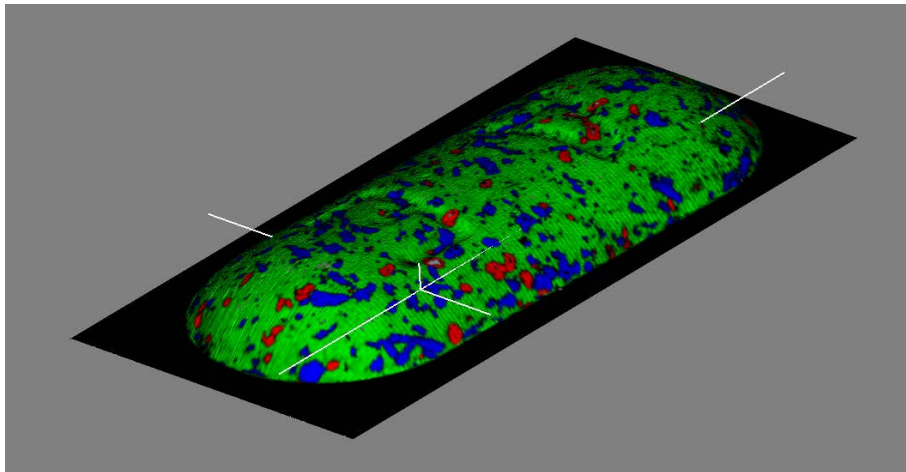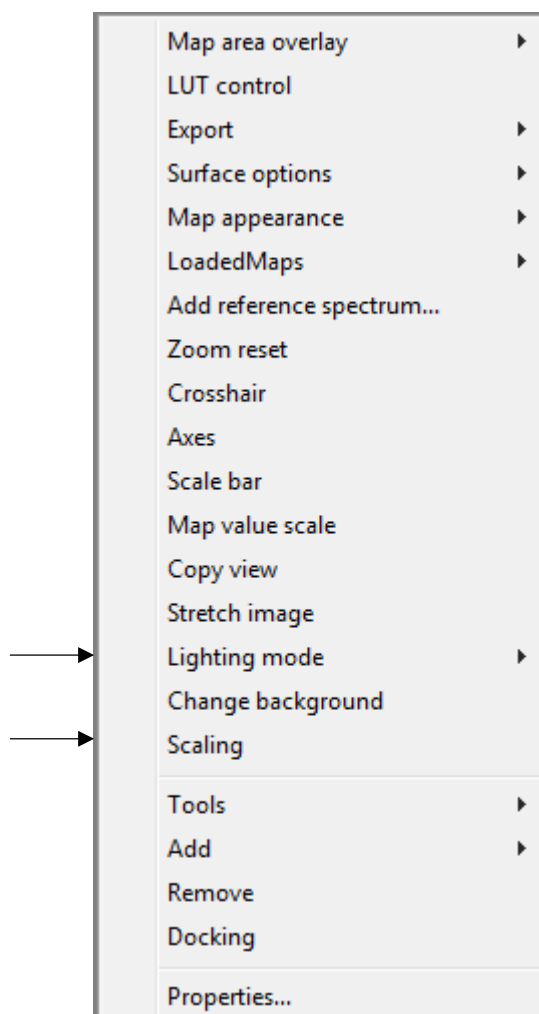| Map area overlay | ▶ |
LUT control	
Export	▶
Surface options	▶	✓ 2D view
Map appearance	▶	Use Livetrack data
Add reference spectrum...		Choose map for Z...
Zoom reset	
Crosshair	
✓ Axes	
✓ Scale bar	
✓ Map value scale	
Copy view	
Stretch image	
Change background	
Tools	▶
Add	▶
Remove	
Docking	
Properties...	

Multiple Raman images are shown below using Livetrack data for the surface option. This image can be rotated in x, y and z using the left mouse button. Holding down the control button enables the image tilt to be corrected using the left mouse button.

When viewing the image in 3D, some parts of the crosshairs will not display if the image is higher than the z height of the crosshairs.

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Right clicking on this 3D image enables the **Lighting mode** to be changed (either ambient or directional lighting can be selected). The z-axis scale of the image can also be stretched/shrunk by selecting **Scaling**.

Map area overlay	▶
LUT control	
Export	▶
Surface options	▶
Map appearance	▶
LoadedMaps	▶
Add reference spectrum...	
Zoom reset	
Crosshair	
Axes	
Scale bar	
Map value scale	
Copy view	
Stretch image	
Lighting mode	▶
Change background	
Scaling	
Tools	▶
Add	▶
Remove	
Docking	
Properties...	

To view the images in 3D in Image Data View, open the Navigator and expand the data branch. Any images associated with the file are listed at the bottom (Maps). Left-click to highlight the image you want to open. Right-clicking and selecting the **Review map** option will load the image into the standard map review window. However, if **Load dataset** is selected the image can be viewed as a top view (image option) or as a 3D plot (surface option). The surface in this case is provided by the loaded data. You do not need to have a viewer window open for either case.

Note the Image data viewer may be hidden at the bottom of the window, especially if a spectrum viewer window is already open. You may need to resize the spectrum viewer from the bottom up.

Large images may take several seconds to load.

The right click functionality in this viewer allows:

- View mode – image view (2D) or surface view (3D)

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- Mouse mode – allows image zooming or value to be reported
- Invert Y-axis – provides same image orientation as in map review
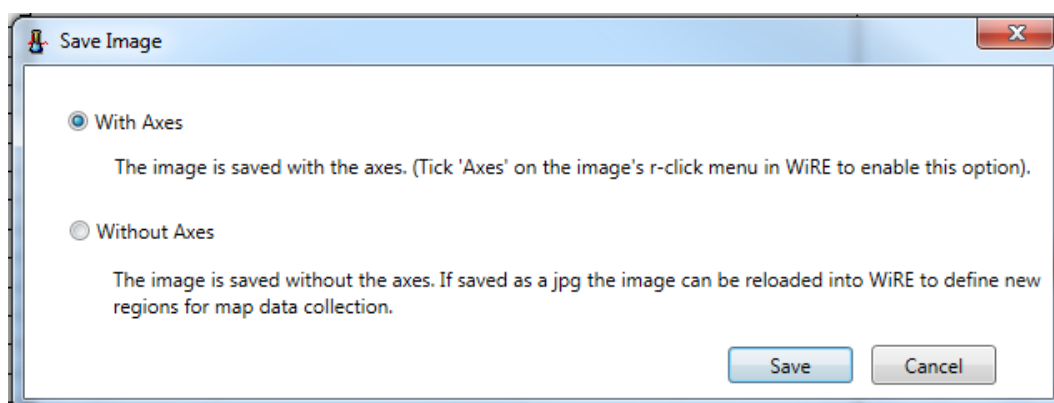- Image quality – allows real or interpolated images to be produced

Additionally, the mouse scroll wheel zooms the map in and out. Holding the left mouse button down allows you to adjust the viewing angle of the 3D plot. Using the context menu, the axes (X,Y,Z) can be constrained or all unconstrained.

Saving images

Generated Raman images are automatically saved to the data file. Images can be deleted by using a right click on the relevant image within the 'Maps' area of the Navigator. A map group (e.g. empty modelling) can be deleted by using a right click on the group header within the same area.

Images can be saved as bmp's or jpg's (with and without axes).

Right click on the image contained within map review. Selecting **Export** will enable two options for saving images: map image and full image. Map image saves the active Raman image only. Navigate to the required folder and name the file type. Select the image type. Full image saves the displayed image (so could be used to save images with multiple Raman images displayed).

Saving 'Without Axes' and as a jpg enables Raman images to be reloaded into WiRE and new map measurement regions defined from the Raman image.

Images can be saved as text:

- Expand out bottom 'Maps' option to show created maps (Navigator, data tab)
- Right click on desired map
- Select **Save map data as….** option
- Select folder, file name, and file type (e.g. text)

The order of the spatial and image value term (e.g. band intensity) within the text file will vary depending on the map type.

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Area text images are exported in the order y, x, i, this is by design and in general export the image so the more slowly varying origins are listed first. So for a volume map you would have z, y, x, i.

The order in which the data appears in the file (and therefore in the image) is the order in which it is collected. Thus in snake and raster the ordering of the data will be different, but in both case we go along X first and then make a change in Y. Note if using StreamLine imaging the data will be ordered in lines of Y values for a fixed X.

Saving spectral / profile data

To extract a single Raman spectrum from mapping data perform the following:

- Navigate to the correct spectrum by using either the next / previous toolbar buttons, or entering the dataset number into the spectrum properties window (Navigator view tab – expand tree to map file - right click on map file – Spectrum properties …)

- To save an individual spectrum use **Save spectrum as …** option (Navigator view tab – expand tree to map file - right click on map file – Save spectrum as …)

- Change the extension type to save spectrum in desired format (e.g. wdf, spc or txt)

It is often useful to include the dataset number within the new spectrum file name.

To extract an X or Y profile from image data perform the following:

- Ensure the suitable profile is displayed in map review (right click - Properties)

- To save individual profile use **Save spectrum as…** option (Navigator view tab – expand tree to profile data - right click on suitable profile – Save spectrum as …)

- Change the extension type to save spectrum in correct format (e.g. wdf, spc or txt)

Note, '@ 3 Y / µm' means the X profile will be save through the specified Y value

Alternatively profiles and spectra can be copied, pasted into new windows, and saved as normal:

- Right click on trace within map review

- Select **Edit** then **Copy**

- From the **Window** drop down select **New**

- Right click within the new window and select **Add** then **Spectrum viewer**

- Right click within spectrum viewer and select **Edit** then **Paste new spectrum**

- Use **File** then **Save as** to save single trace

Recovering lost data

Renishaw has incorporated a function to allow the recovery of data which the user has not saved either by using the 'File….Save as….' method or by defining the filename using the 'Auto save' option within the 'File' tab of the measurement. This method is not intended to be routinely used as a replacement for saving data and should not be relied upon in such a way.

Each file collected and not saved by the user is automatically saved as a temporary file on the local hard drive of the instrument computer. The file is stored within the 'Temp' folder and can be accessed using inputting '%temp%' into the Windows Explorer address. Each file will take the format of:

Wir#####.tmp

Where ##### represents a series of numbers or letters automatically generated by the Windows operating system. The files are saved for 7 days only to avoid the build-up of large numbers of files within the computer. The user is required to know the time and date the data started collecting. The files can be ordered by date or size.

The file extension should be renamed from 'tmp' to 'wdf'.

The data can now be opened in WiRE 5 and resaved and viewed as normal.