

TM033 - LiveTrack™ automatic focus-tracking

WiRE™ 5

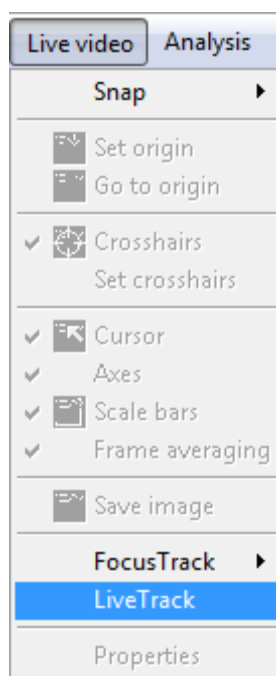
This document aims to show the WiRE™ 5 user how to use LiveTrack™ automatic focus-tracking for sample analysis in white light and Raman modes and how to generate height images. It assumes that all necessary hardware is present which enables the capability (inVia Qontor model).

It also contains information about how to get the most out of LiveTrack. How to optimise the set-up on challenging samples and the order of the workflow.

LiveTrack automatic focus-tracking

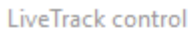
Ensure that the correct laser and objective have been selected in the **Sample Review** toolbar (either spot or line focussed lasers can be used).

1. Open the LiveTrack control interface by selecting **Live video** then **LiveTrack**.



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2. Select the required **Safety mode** from the options available in the drop-down menu.

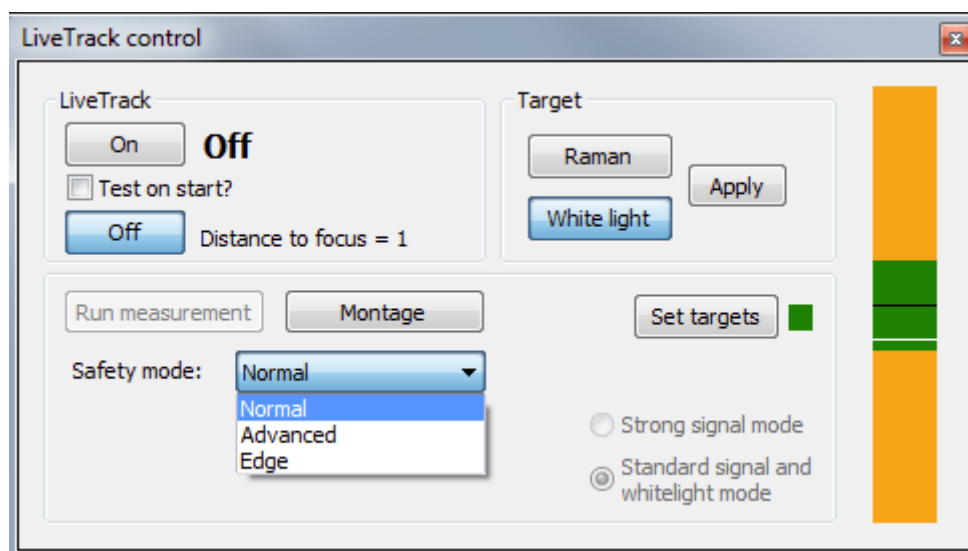
The following safety modes are available in the LiveTrack control interface:
Advanced, Normal and Edge.

Selecting **Advanced** mode applies no safety features while LiveTrack is on. This mode should only be used if the height changes of the sample are known and the user is confident that the objective will remain clear of the sample surface during the measurement.

In **Normal** mode, while tracking with LiveTrack, the stage will not move more than 90% of the working distance of the selected objective away from the height at which LiveTrack was engaged. If the stage movement required to focus the sample is greater than this 90%, LiveTrack will turn off and, if a measurement is being run, it will abort.

Selecting **Edge** mode allows maximum and minimum soft z-limits to be chosen. With LiveTrack on, the stage will not move beyond the limits set. If these limits are met, the stage will be maintained at its maximum/minimum limit. The measurement will continue and the sample will continue to be tracked between the chosen limits.

The safety mode of choice should be selected before LiveTrack is turned on in either white light or Raman modes. Safety modes are persisted; the chosen mode will remain selected until changed by the user.



3. For focus-tracking in white light mode, select **White light** and **Apply**.

Ensure that the sample is in focus under the cross hairs and the required laser power is selected in the Sample Review toolbar. The indicator box next to set targets should be coloured green. Select **Set targets**.

If the indicator box is amber, move to a different sample region until it becomes green. Setting targets when amber is possible but may result in unreliable operation.

If the indicator box is red, check the focus manually and, if necessary, increase the laser power until the indicator is green

On setting targets, the white horizontal line in the coloured bar to the right of LiveTrack control should move to the centre of the green region of the bar. The green region represents the depth of field of the selected objective. The orange region is five times the depth of field of the objective.

In white light mode, LiveTrack will generally be able to track with laser powers equal to or greater than 0.05%, depending on the sample surface form.

For optimum white light viewing of the sample, turn the sample illumination to maximum in the Sample review toolbar and decrease the video exposure time until the appearance of the laser is minimised and the surface of the sample is visible.

Selecting **On** will then turn LiveTrack on (focus-tracking can then be turned off by selected **Off**).

4. To use LiveTrack for Raman data collection, a measurement must first be set up.

With a measurement window open and the sample in focus at the cross hairs, select **Raman** and **Apply** in the LiveTrack control interface. The indicator box next to set targets should be coloured green. Select **Set targets**

If the indicator box is amber, move to a different sample region until it becomes green. Setting targets when amber is possible but may result in unreliable operation.

If the indicator box is red, check the focus manually and, if necessary, increase the laser power until the indicator is green

If the laser power reaching the LiveTrack camera is too high, a message will appear saying that too much signal is reaching the camera. If this is the case, **Strong signal mode** then **Set targets** should be selected.

The measurement can then be started by selecting **Run measurement**.

When the measurement is complete, LiveTrack will turn off automatically.

LiveTrack measurements cannot be queued.

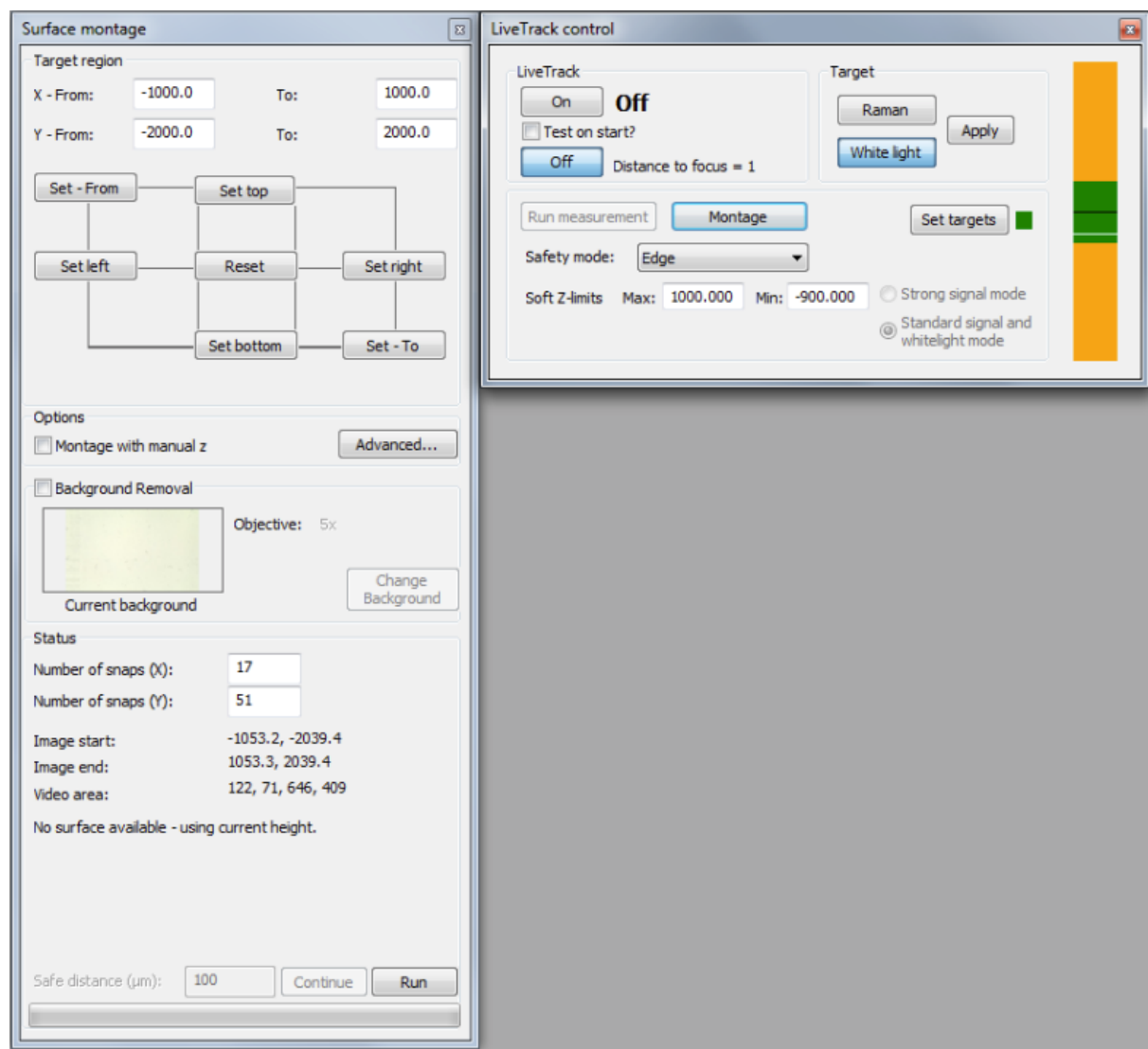
LiveTrack control options

1. Selecting **Test on start** will apply a short (approximately 1 second) test when LiveTrack is turned on, before tracking begins. If this test fails, LiveTrack will not start tracking.

This test may fail if, for example, targets are not set correctly or the wrong objective is selected in the Sample review toolbar.

This test ensures that LiveTrack will track a sample successfully during a measurement which has been set up in the same configuration as the test.

2. To obtain a white light montage with automatic focus-tracking, select **Montage** in the LiveTrack control interface. Set up the montage and, ensuring LiveTrack is turned on, select **Run**.

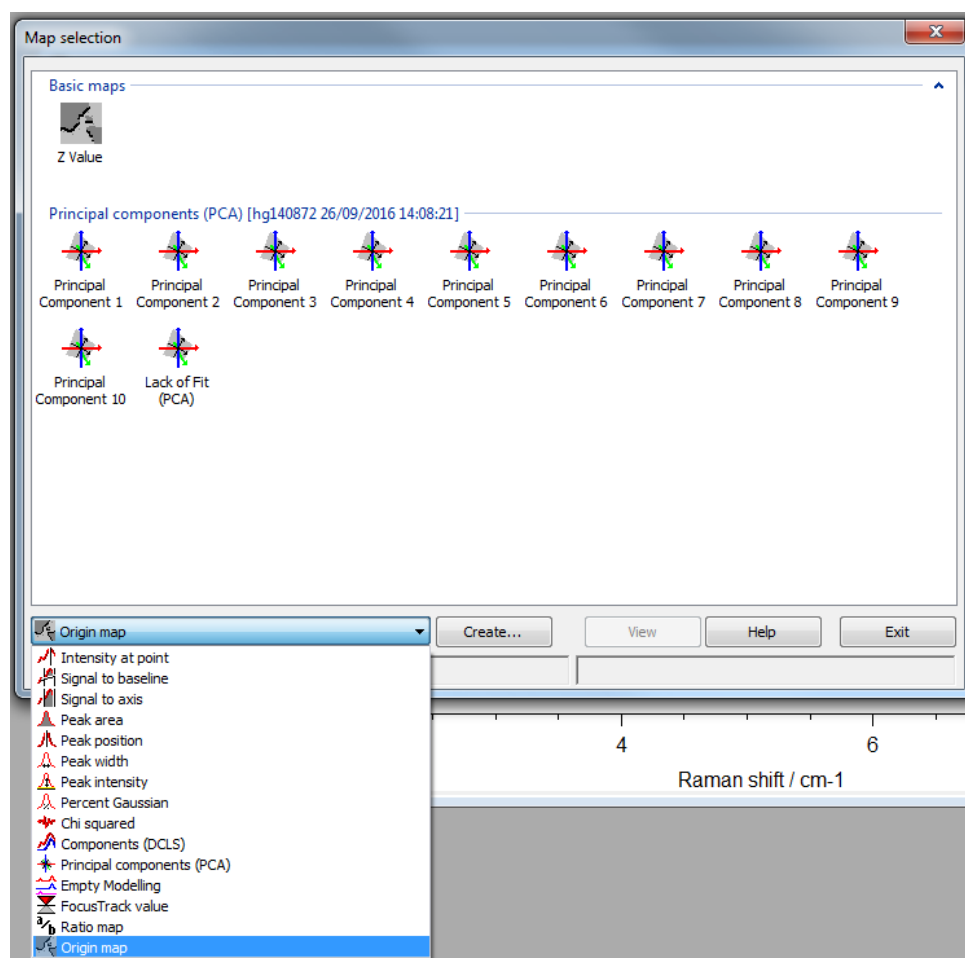


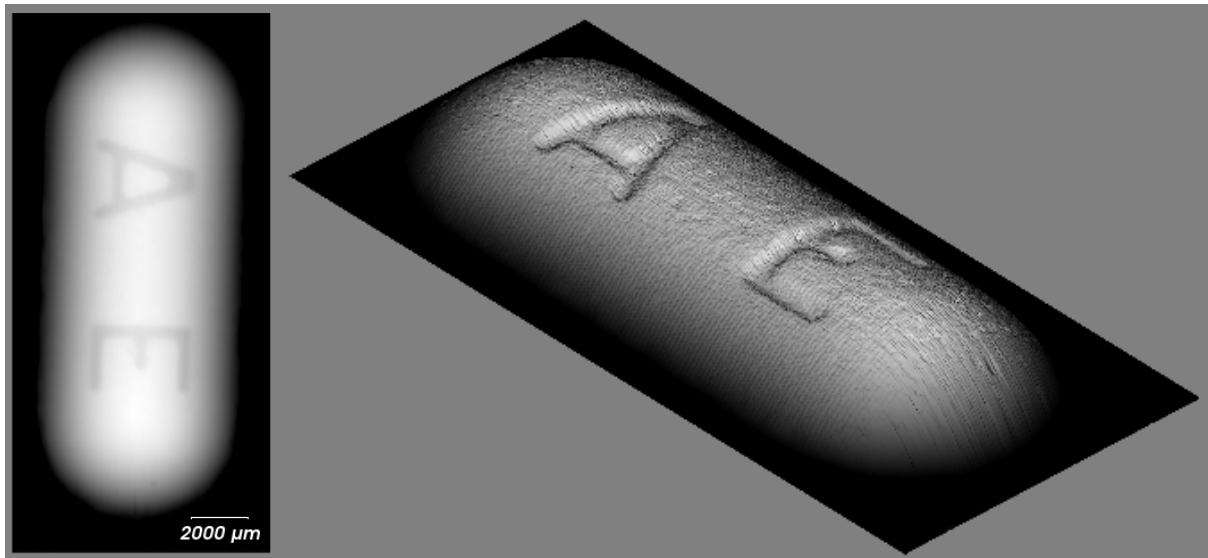
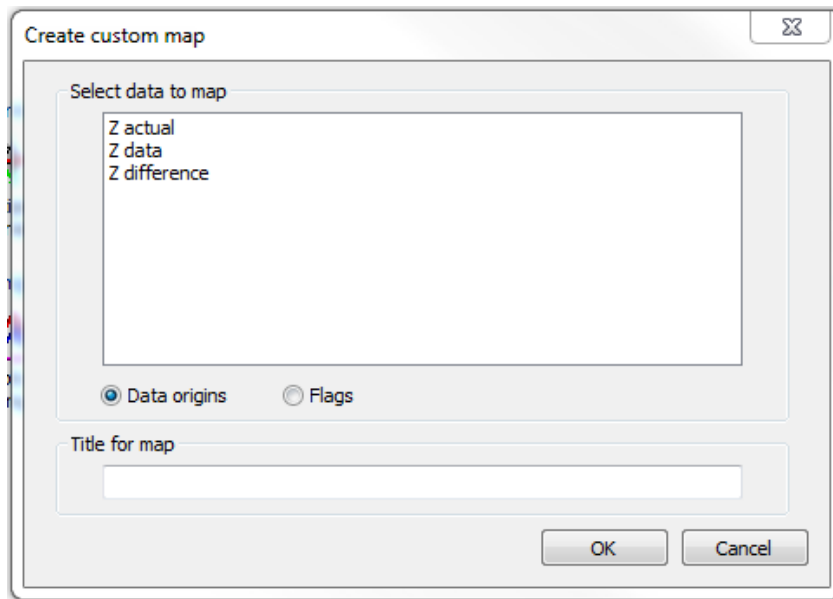
LiveTrack topographical information

To obtain a map of the topography of the sample, as determined using LiveTrack automatic focus-tracking, select **Analysis** then **Mapping review**. From the drop down menu of available map types, select **Origin map** then **Create....**

Three topographical maps are available: selecting Z data will generate a map of the height of the stage. Z difference is the distance between the height of the stage (Z data) and the height which LiveTrack has calculated as the in-focus position. Z actual is the sum of Z data and Z difference; it most closely represents the topography of the sample.

An example Z data map of a tablet is shown below in 2D and 3D (see TM018 for more information on viewing images in WiRE).



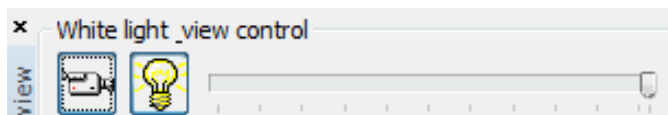


Applying LiveTrack to different samples – tips

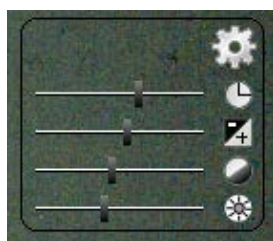
LiveTrack is an optical technique that uses information from the laser light returning from the sample to keep the sample in focus. LiveTrack relies on having an optical interface, a surface, to provide contrast to work. Therefore, samples where a surface isn't present, is not well defined, or where multiple surfaces are present (within the range of the objective being used) may not be compatible with LiveTrack.

Best practice for applying LiveTrack to map data collection

1. Before using LiveTrack, maximise the white light intensity (in the Sample Review) and optimise the video exposure to provide a comfortable white light view of the sample on the video.



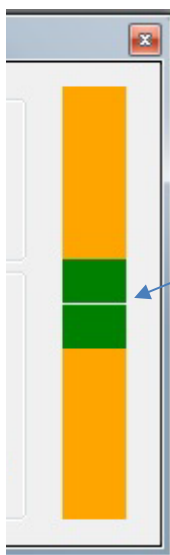
Maximised white light in
Sample Review



Exposure
Gain
Brightness
Contrast

Hover over Cog icon in
Video to access exposure
control

2. Collect a static image or montage of the sample to enable the Raman analysis region to be later defined.
3. Add the laser onto the sample and ensure the laser spot is tightly focussed (use the laser spot focus to ascertain the 'correct' focus at that sample point).
4. Initiate LiveTrack, apply white light mode and set targets (when box is green). If the signal is too low, increase the laser power until the signal is sufficient and then set targets. If the signal is too high, select 'Strong signal mode'
5. Turn on LiveTrack and optionally move the sample using the trackball to check that tracking is maintained at different sample points. Use the position of the white line in the coloured bar to ensure focus has been reached and is stable:



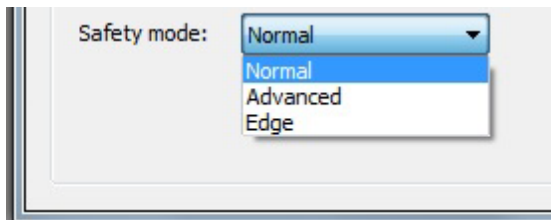
The white line should be centred in the green region and should not fluctuate outside of this region.

Generally during data collection, the white line should stay within the yellow region (related to the depth of field of the objective)

6. **Optionally**, Edge mode limits can be optimised if the region for analysis includes areas with sudden drops (e.g. areas of the edge of the sample).

Edge mode soft limits will prevent the sample being moved further than these Z values during LiveTrack operation. Ideally Edge limits should be set to Z values close to those which define the extreme of the surface topography to be analysed.

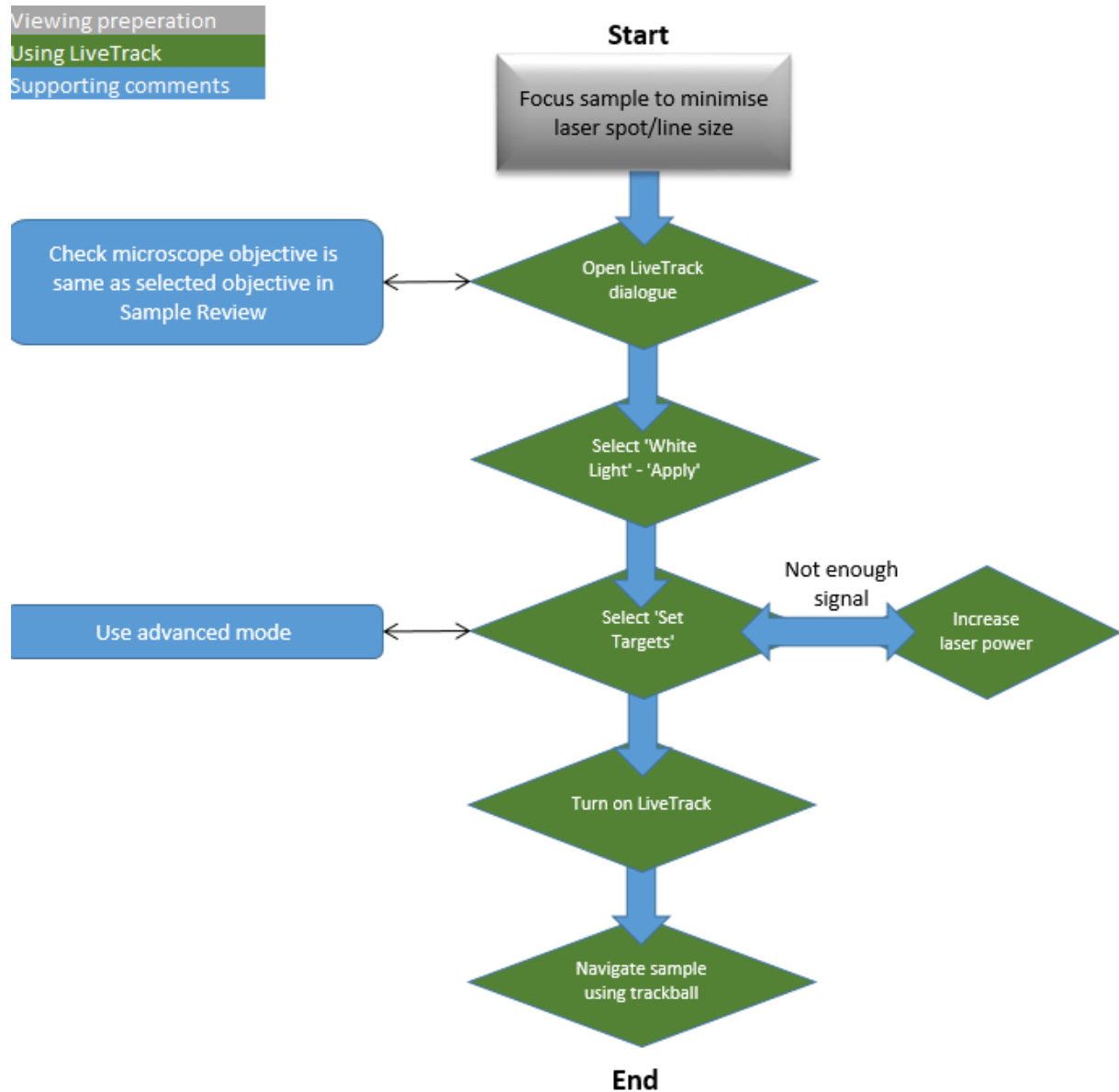
If not already in Edge mode, turn off LiveTrack and change to Edge mode.



Start with sensible soft limits values by looking at the current Z position and estimating the expected variation from this in Z. Approach the edge to be tested and ensure the edge of the same is tracked, soft limits are applied beyond the edge and tracking is re-found coming back to the sample. This needs to be done against the context of the lowest point of the surface to be tracked. The high point of the sample should be less sensitive to the soft limit but should still be close to the maximum value expected.

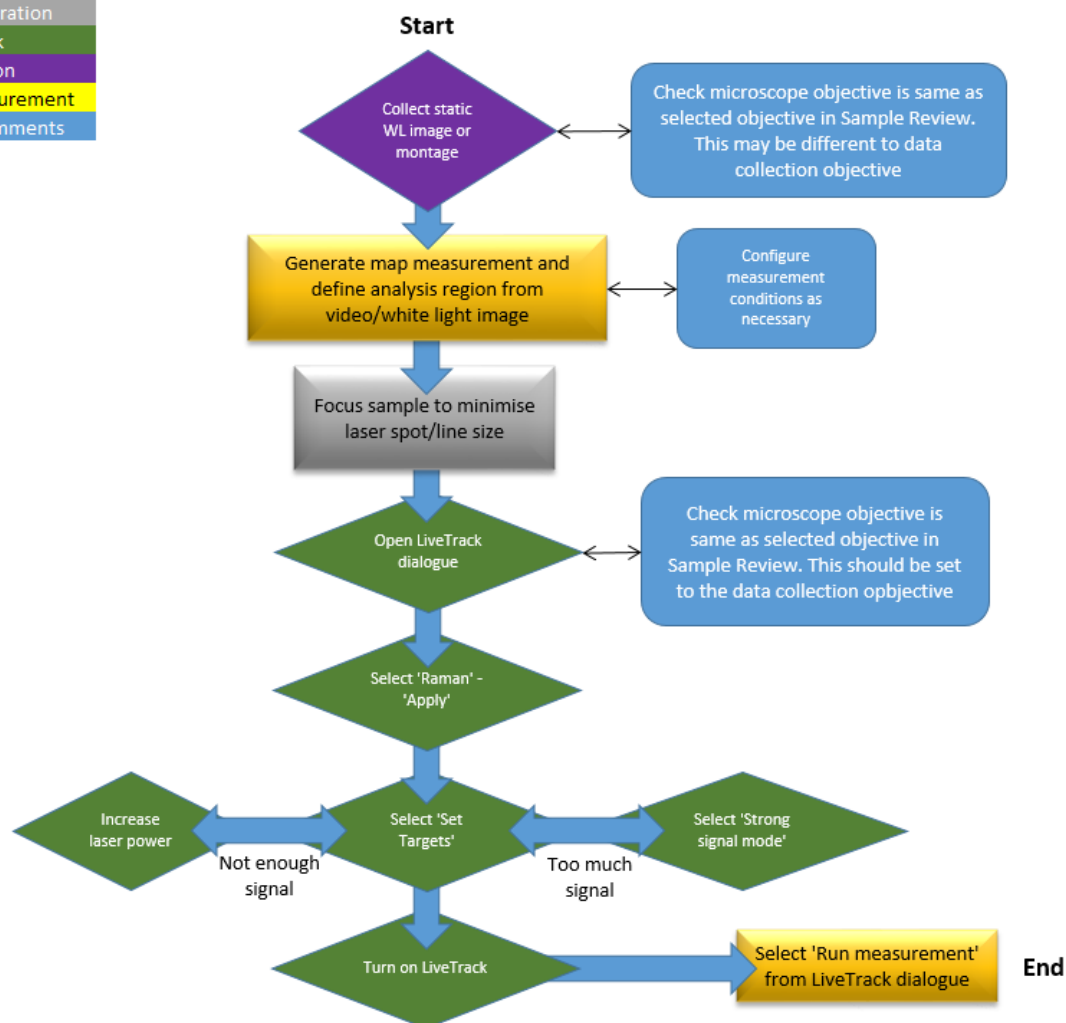
7. Define the analysis region from the static image/montage (from Stage 2) and configure the measurement.
8. With LiveTrack on, move the sample to the point closest to the start of the data collection (i.e. start with Z close to the first sample collection point).
9. Turn off LiveTrack and select Raman mode and apply.
10. Set targets again.
11. Select Run measurement from the LiveTrack dialogue.

The following flow charts also detail how to optimise LiveTrack for both white light and Raman data collection purposes. Note that samples where an optical surface is not present, is not well defined, or where multiple surface are present (within the range of the objective being used) may not be compatible with LiveTrack.

Applying LiveTrack to different samples – Flow chart examples**White light**

Raman mapping

Viewing preparation
Using LiveTrack
Image collection
Defining measurement
Supporting comments



Raman mapping – detailed

