

TM031 – AFM Hotspot

WiRE™ 5

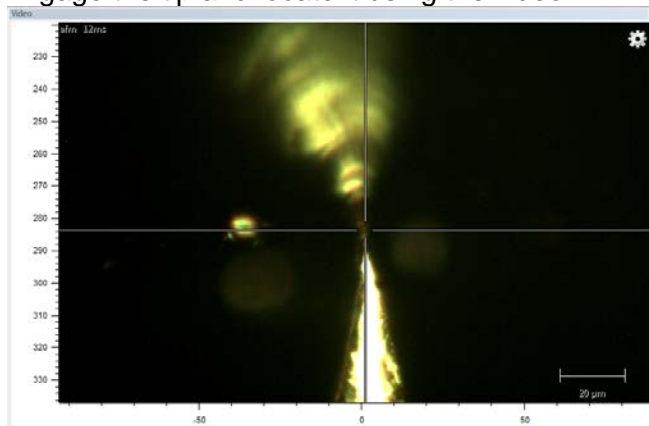
This document aims to show the WiRE™ user how to use the hotspot function to optimally align the Raman laser with an AFM tip, a necessary requirement for tip enhanced Raman spectroscopy (TERS) experiments. This optimum alignment is defined as the Raman laser position on the TERS tip that results in the highest intensity signal being received from the sample.

Suitable knowledge of the AFM and WiRE 5 software are assumed in this document.

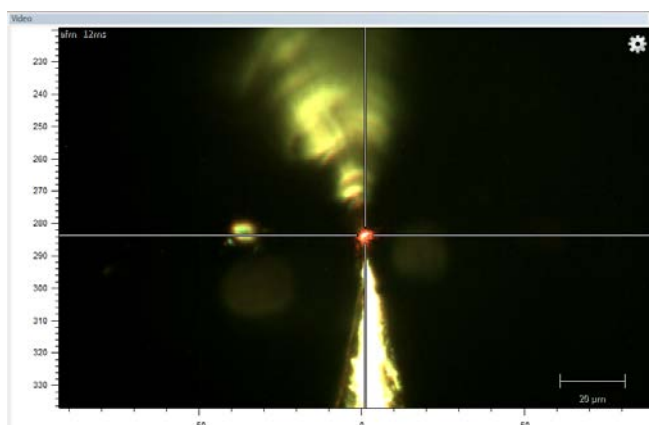
Using hotspot

1. Set the AFM as the current microscope in WiRE.

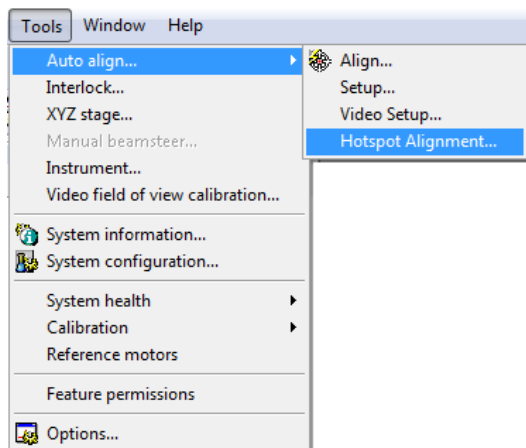
Engage the tip and locate it using the video.



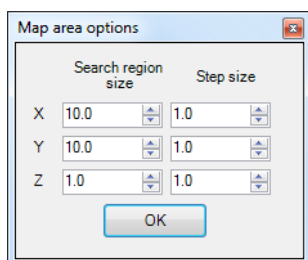
2. Focus the laser light onto the tip apex.



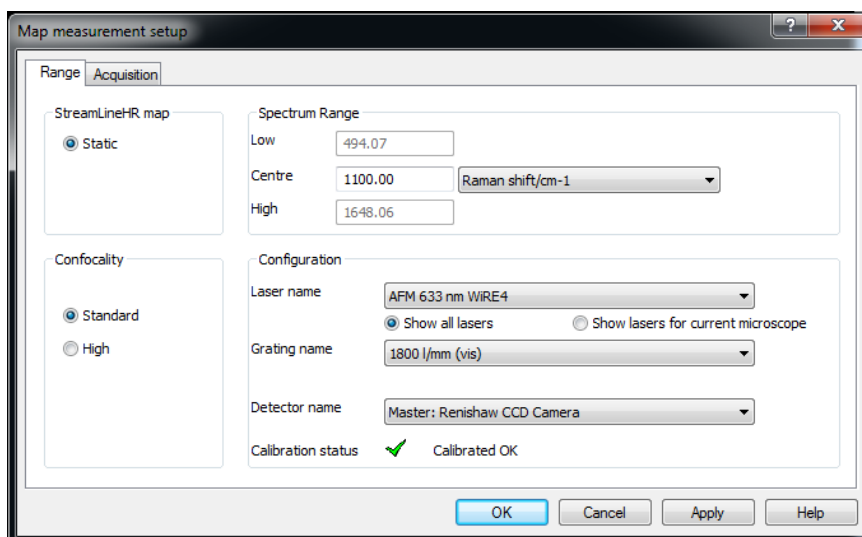
3. Select **Tools.....Auto align.....Hotspot Alignment....**

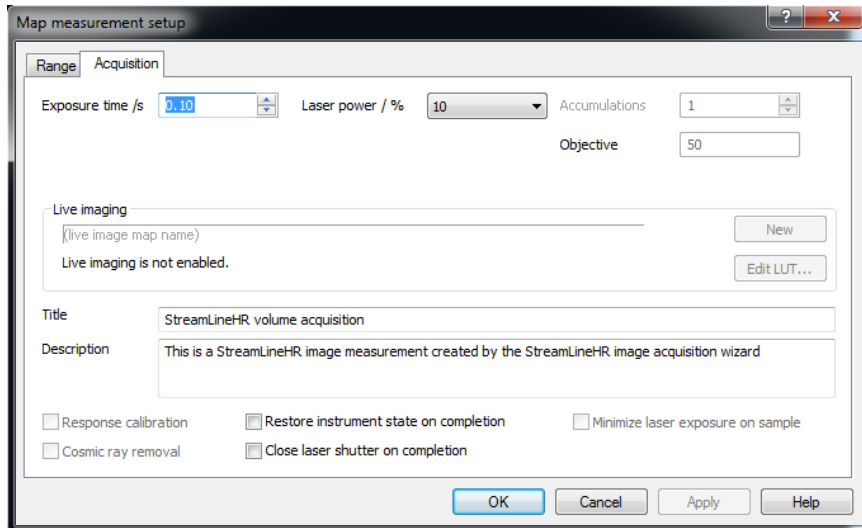


The 'Map area options' dialogue window is automatically displayed. Set the desired search region and step size, if different from the default values. The search region is the volume around the crosshairs (in this case centred on the TERS tip) through which the laser will move in steps defined by the user (micrometer units). Raman spectra will be collected at each of these steps. The TERS hotspot will be located within this volume where the sample's Raman peaks, at a spectral position defined by the user, are at the highest intensity (A TERS hotspot will not always be seen, for example in the case of a bad tip or when acquisition time is too small).

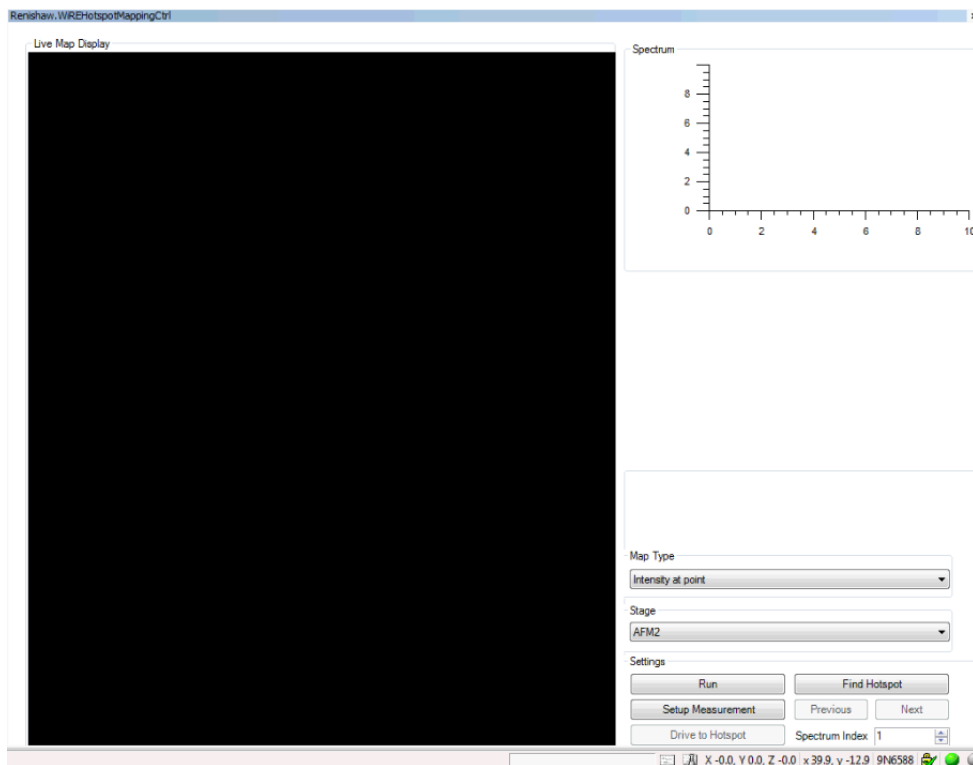


Click **OK** to display the 'Map measurement setup' window. This window should be familiar to the user as the 'Range' & 'Acquisition' tabs are identical to those in the 'Spectral acquisition setup' window (see TM004).

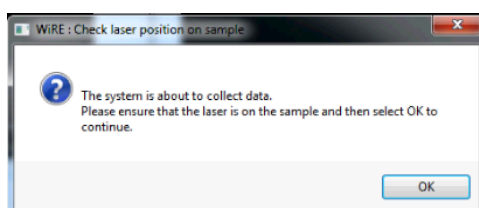




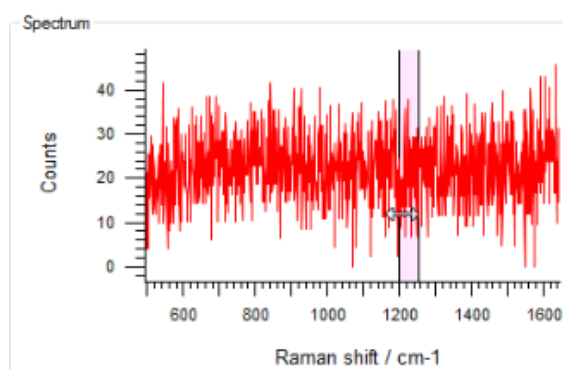
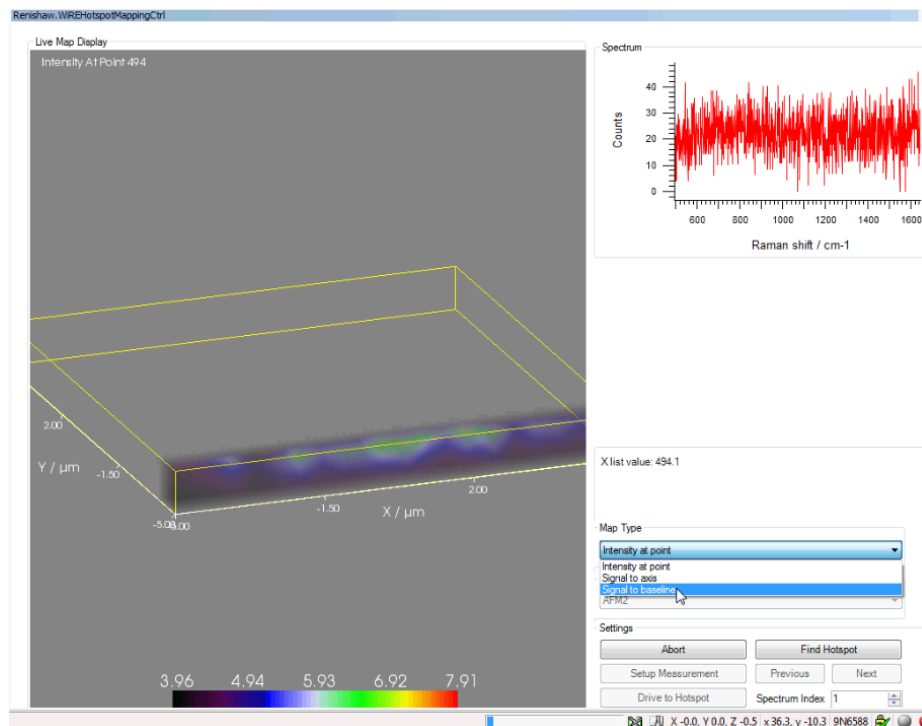
Set all parameters within this window, ensuring a suitably low laser power is selected to prevent damage to the TERS tip, & click **OK**. The 'WiRE Hotspot Mapping' viewer will automatically open. To readjust measurement settings click the 'Setup Measurement' button in the 'Settings' section of this viewer.



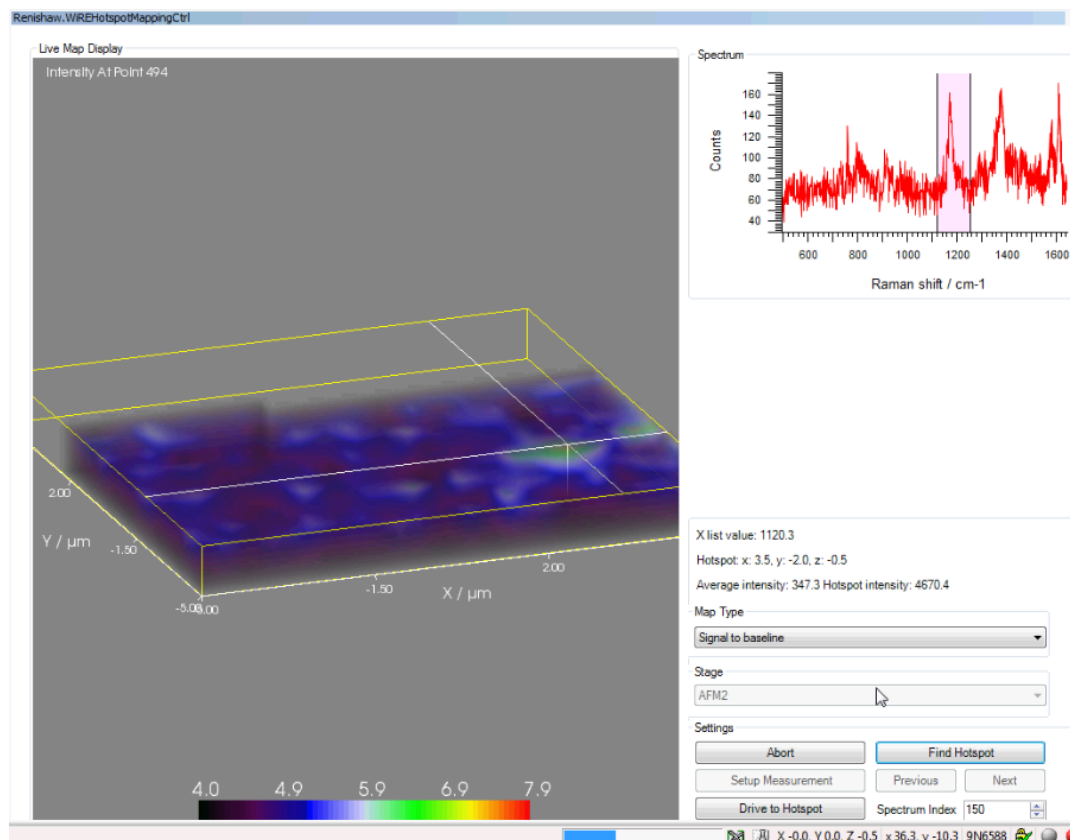
Click **Run** to begin hotspot alignment. A prompt will appear. Click **OK** to continue.



- The system will begin collecting data. The 'Live Map Display' section will update as data is collected. The 'Spectrum' section will initially show only the first spectrum collected. The map type can be set to 'Intensity at point', 'Signal to axis' or 'Signal to baseline' by selecting the desired option from the 'Map Type' drop down list. Map parameters are set using the limit bar(s) in the spectrum section. Intensity at point is the default map option. The 'X list value' displays the spectral position at which the Raman intensity is being used to create the map.



- Click **Find Hotspot** to begin searching for hotspots. The spectrum section will update to display the spectrum containing the highest signal at the user defined spectral position. The hotspot coordinates will be displayed, along with the hotspot intensity and average intensity across the map at this position. The 'Spectrum index' will update to show the acquisition number for the displayed hotspot within the map. This information will update only if another hotspot with greater intensity at the user defined spectral position is found.



6. Once the hotspot search is complete, the user can use the 'Previous' and 'Next' buttons to search through all hotspots identified by the software. Note that the software may incorrectly identify the 'best' hotspot, for example if a cosmic ray with an intensity greater than any of the real spectral information at the user defined position is present. Once the best hotspot has been verified by the user, ensure this hotspot is displayed in the hotspot mapping viewer – i.e. its spectrum, coordinates, intensity and spectrum index should be displayed on screen – and click **Drive to Hotspot**. The laser will move to the hotspot coordinates and is now optimally aligned with the AFM tip and the user can begin to conduct TERS experiments on their sample