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inVia™ Qontor® confocal Raman microscope

The inVia Qontor confocal Raman microscope is a flexible research-grade instrument with unique real-time focus-tracking capabilities.

The inVia Qontor retains all the functions of Renishaw's world-renowned inVia Reflex™ microscope and adds a range of usability features, including powerful LiveTrack™ focus-tracking technology.

Now you can easily study samples with uneven, curved, or rough surfaces.

- Keep your view of the sample in focus while you survey it under manual control
- Raman-map rough, uneven, and curved surfaces
- Little or no sample preparation is required
- View Raman chemical images in 3D and see both the chemistry and the topography
- No need for a time-consuming surface pre-scan
- Maintain focus during dynamic measurements, such as sample heating/cooling and during very long measurements when the environmental conditions are varying

LiveTrack technology

To maintain focus, LiveTrack combines precise vertical motion control of the sample stage with new optical technology.

LiveTrack works in both white-light video viewing and Raman acquisition modes, offering significant advantages over alternative techniques (see 'Focus tracking techniques', on final page).

Maintain focus

Focus is maintained in real-time as the sample:

- is scanned during Raman data collection
- is moved under user command
- expands or contracts (for example because of temperature or humidity changes)

LiveTrack can be offset vertically, enabling Raman data collection to occur at a fixed height below or above the interface being tracked.

LiveTrack saves you time during white-light video viewing

Put your sample on the microscope stage, manually focus using the video viewer, activate LiveTrack, and you are done. LiveTrack will maintain focus as you use the trackball to move the stage around to survey the sample.

This saves you considerable time as manual 'move-focus-move' operations are replaced with just 'move'. You can concentrate on the features on your sample, rather than continual refocusing.

Raman-map rough, uneven, and curved surfaces

With LiveTrack you can acquire Raman data from rough surfaces. This not only saves time (you no longer need to section samples such as minerals and pharmaceutical tablets) but also enables you to study the physical and chemical state at the surface, rather than in the bulk.

As a Raman map progresses, LiveTrack continuously adjusts the sample height to keep the sample in focus. The resulting data can be displayed as 2D ('top-down') images or as 3D rotatable surfaces which convey not only the chemical structure of your material, but also its topography.

This capability goes beyond rough surfaces; it is also useful for angled or uneven surfaces, such as some semiconductor wafers, which can be slightly bowed. Although the bowing may be very slight, without LiveTrack it can be enough to compromise high magnification Raman analysis.

LiveTrack can be used on any interface across which there is an appreciable difference in refractive index. Normally this will be the surface interface between a solid sample and the air, but it could also be the interface between two dissimilar layers. You can also specify an offset between the Raman focus and the LiveTrack focus, so you can take the Raman measurements a fixed distance below or above a surface.

Use with dynamic samples

LiveTrack will keep the sample in focus even if the sample height is changing because of humidity, temperature or creep changes. LiveTrack can work though optical windows so you can, for example, use it to keep focus on a sample in a hot-cold stage during a series of measurements, made as the temperature is changed.

Using LiveTrack to maintain focus on the surface of a sample in a high temperature cell.

Displaying the results

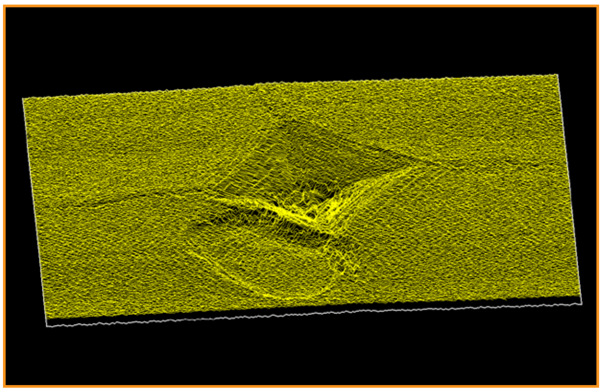
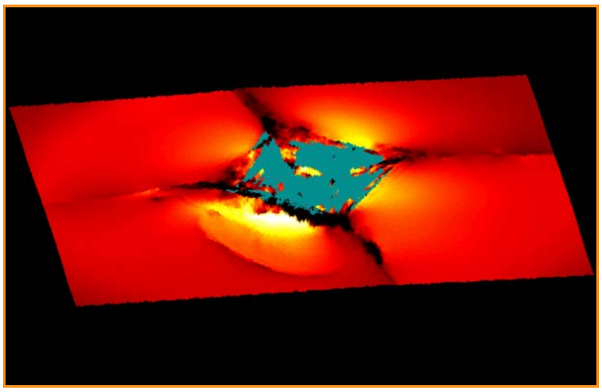
If LiveTrack is active during a Raman measurement, inVia Qontor records surface height data. Renishaw's WiRE™ (Windows-based Raman Environment) software can then generate stunning 3D surface plots of the Raman data. The user can rotate and zoom these images and change the colour tables and illumination to get the view that best shows the important information.

The user can also obtain cross-sections of the samples in x- and y-planes, giving dimensional information, and can export values to a text file for further analysis.

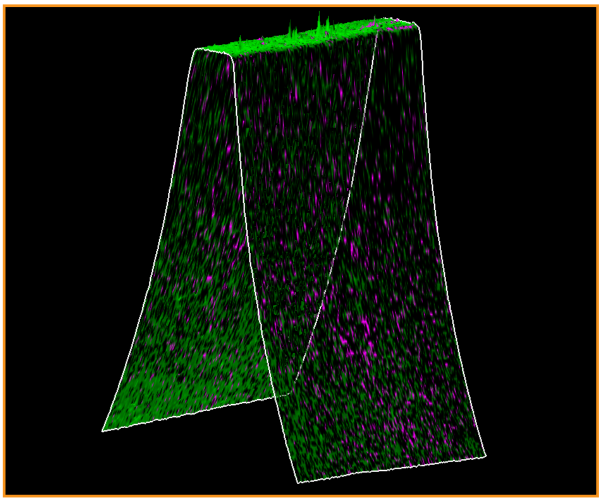
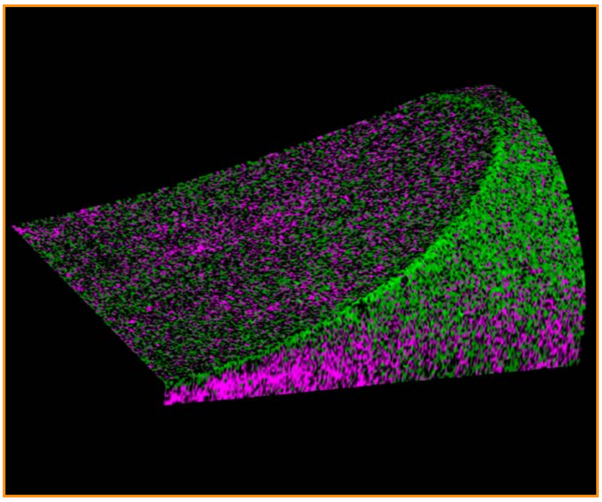
More power, more samples

With inVia Qontor and LiveTrack you can not only study your existing samples in more detail, more efficiently, but you can also analyse a whole new range of uneven, rough, and curved samples.

Get inVia Qontor and add an exciting new dimension to your research by moving your surfaces from 2D to 3D.

Indentation of a silicon wafer by a diamond Vickers indenter, using 500 g load. Confocal StreamHR Raman data collected at 532 nm excitation with LiveTrack (100× objective). The analysed surface is 78 µm wide, 58 µm deep, and 4.6 µm high. The topography image (left) shows median and lateral cracking, and material removal by chipping. The image also reveals the raised area surrounding the indent, caused by the plastic deformation.
The Raman image (right) reveals stresses around the indent (compressive regions white/yellow, tensile regions black/dark red). The blue-green region within the indent is silicon that has been very highly plastically deformed, with a highly amorphous structure.

Analysis of a coated flat-head screwdriver bit. StreamHR confocal Raman data were collected at 532 nm excitation, with LiveTrack (20× objective); two images were generated, with the bit oriented side- and end-on. The images reveal the distributions of TiN (green) and TiO_2 (magenta). The imaged surfaces are: 4.3 mm wide, 4.0 mm deep, and 6.4 mm high (left image); and 8.1 mm wide, 5.1 mm deep and 3.6 mm high (right image).

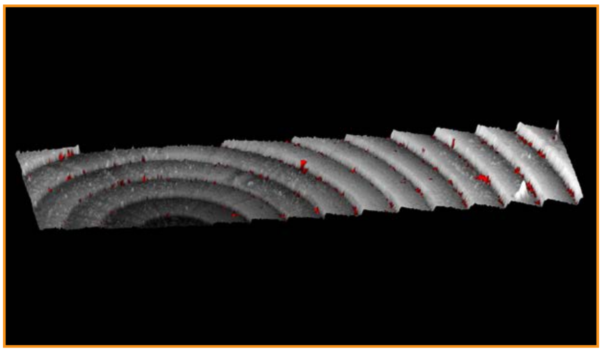
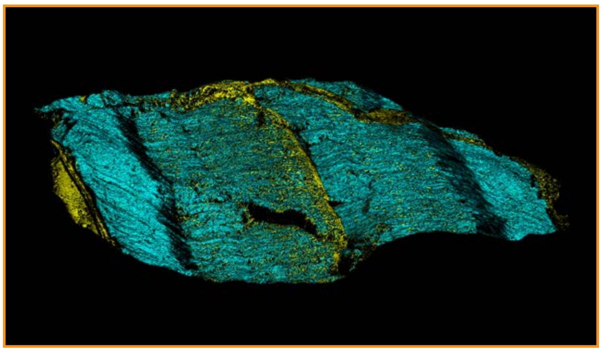


Image of a Fresnel lens showing the concentric ring lens topography and, from Raman analysis, contamination (red), which is preferentially located in the grooves of the rings. Data were collected using 532 nm excitation and a 50× objective. The analysed surface is 4.5 mm wide, 1.3 mm deep, and 24 µm high.



Quartz-dominated rock (Tiger's Eye) examined using 532 nm excitation and a 20× objective lens. The Raman image shows quartz (cyan) and inorganic carbonates (yellow). The imaged surface is 47 mm wide, 26 mm deep, and 3.0 mm high.

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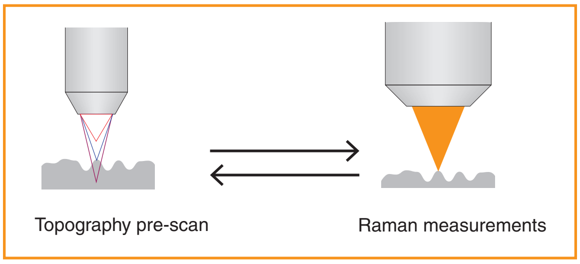
Focus-tracking techniques

A variety of other focus-tracking techniques can be used to scan uneven surfaces.

Independent prescan

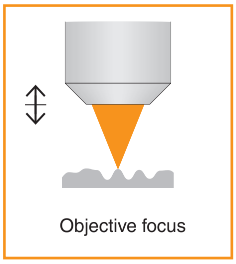
An independent focusing system prescans the sample prior to Raman data acquisition. This is often performed by moving the sample laterally from under the Raman microscope to under the topography scanner.



Independent prescan

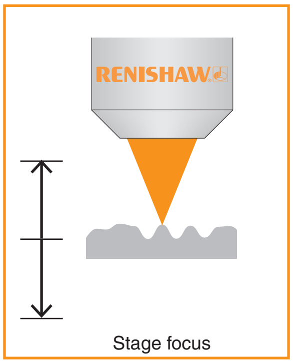
Focusing microscope objective

The microscope objective lens, rather than the sample stage, moves vertically to keep the sample in focus during scans.



Focusing microscope objective

LiveTrack technology



Renishaw's LiveTrack

In contrast, Renishaw's LiveTrack technology continually adjusts the height of the motorised microscope stage to maintain focus during viewing and scanning.

This has many advantages:

- It gives a continuous closed-loop feedback of focus, both in white-light and Raman operation
- It does not use a pre-scan, which can be time consuming, might suffer from registration problems and is unsuitable for samples whose heights are dynamically changing (from mechanical creep, temperature variation, drying, etc.)
- It offers a large range of focus travel unlike most pre-scan or objective lens focusing systems
- It supports the whole horizontal travel of the microscope stage, unlike independent pre-scan systems that displace the sample laterally for the pre-scan.

Specifications

Parameter	Value
Tracking of focus	Better than objective depth of field
Maximum overall height range	28 mm, for the standard microscope
Maximum lateral range	Only limited by the travel of the sample stage. For Renishaw's MS20 stage this is 112 mm × 76 mm
Supported objective lenses	Standard Renishaw objective lenses from 10× to 100×
Supported lasers	Visible and near-infrared, from 405 nm to 830 nm inclusive
EN 60825-1:2014 classification	Class 3B Laser product*

*Class 4 or Class 1 for certain configurations.

Renishaw. The Raman innovators

Renishaw manufactures a wide range of high performance optical spectroscopy products, including confocal Raman microscopes with high speed chemical imaging technology, dedicated Raman analysers, interfaces for scanning electron and atomic force microscopes, solid state lasers for spectroscopy and state-of-the-art cooled CCD detectors.

Offering the highest levels of performance, sensitivity and reliability across a diverse range of fields and applications, the instruments are designed to meet your needs, so you can tackle even the most challenging analytical problems with confidence.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Please visit www.renishaw.com/qontor for more information.