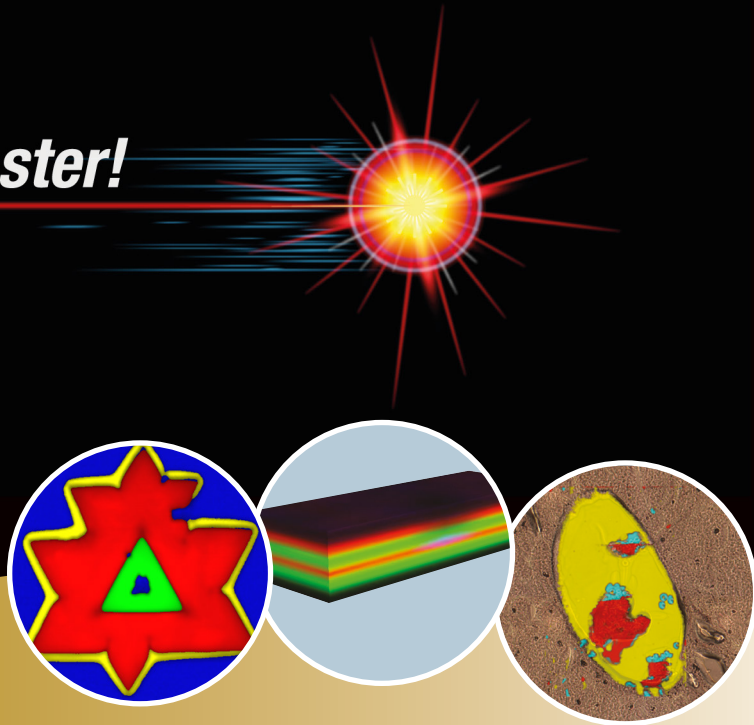




LabRAM Soleil

RAMAN MICROSCOPE

*Getting **There** Faster!*



www.horiba.com/labramsoleil

LabRAM Soleil: Getting *There* Faster!



When he created Maison Soleil, and then Jobin Yvon, today HORIBA Scientific, Jean-Baptiste Soleil never imagined the LabRAM Soleil microscope would be named after him 200 years later. The first multimodal Raman microscope designed for UV-Vis-NIR imaging, the LabRAM Soleil sets the new standard for your advanced research laboratory and quality control department. Its innovative optical design affords images of unmatched precision and very high resolution spectra.

The LabRAM Soleil Raman microscope: Your ideal lab companion



**Intuitive software
to simplify workflows**
A wealth of apps in LabStore



With **LabRAM Soleil** and its built in **LabSpec** software, acquisition and analysis of your measurements is a whole lot faster. The intuitive interface lets you harness the full power of the system, and you can configure the software to suit your specific needs.

Automation

Focus on your job,
it takes care of the rest

Use **LabRAM Soleil's** advanced **automation** features every step of the way to save time and focus on your other tasks. This system is twice as automated as the previous generation, speeding up your workflow like never before:

- True self-operating
- Remote maintenance**
- Up to 6 motorized lasers (4 built-in, 2 external)
- Up to 6 spectroscopic modes (Raman, Ultra Low Frequency, Photo and upconversion luminescence, ...)**
- Instant objective recognition*

Ultrafast imaging

Quick and illuminating results

Unrivaled **multimodal imaging** performance gives you the ability to observe samples in different modes for all kinds of applications, thanks to the innovative design of the optical compartment, its **optimized broadband dielectric mirrors** and a **high throughput spectrometer**.

SmartSampling*

To map up to 100 times faster

With HORIBA's patented *SmartSampling™* technology added on and the LabRAM Soleil's stability and precision, hyperspectral mapping is made much faster by an image-compression algorithm.

QScan*

Lightsheet confocal imaging

QScan™ patented confocal imaging is a high quality optical system to enable scanning of the excitation laser over the sample surface for the following customer benefits:

- Image multilayer sample with high confocality
- Map your sample without moving it
- Point-and-shoot operation, directly on the video image

(*) Patented feature
(**) Depending on configuration

The LabRAM Soleil multimodal microscope has been designed with application experts with automation features, ultrafast imaging, robust design and intuitive software, to supercharge your analyses.

Scale new horizons with multimodal microscopy:

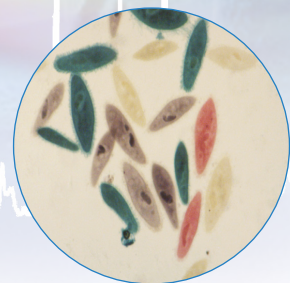
LabRAM Soleil examines your samples from all perspectives

Your samples deserve full analytical treatment.

LabRAM Soleil offers a range of features to enable comprehensive analysis of your samples.

Great variety of optical viewing modes

- Reflected (episcopic) or transmitted (diascopic) illumination
- Bright-field/dark-field, epifluorescence, phase contrast and differential interference contrast (DIC) microscopy
- ViewSharp™ 3D topography



Paramecium cells viewed with bright-field

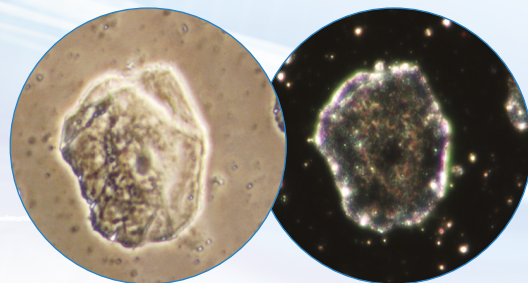
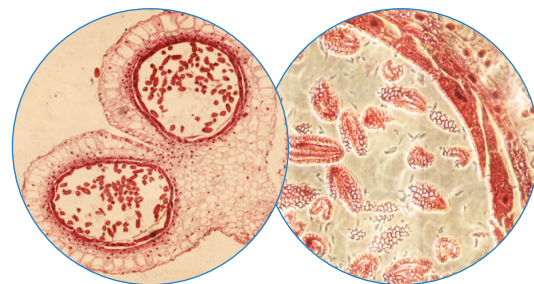
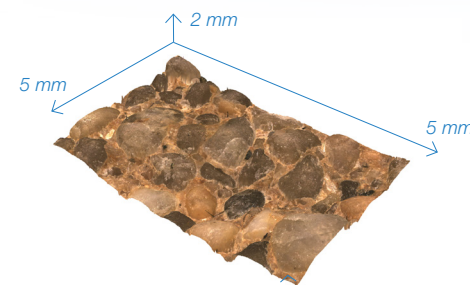


Image of saliva cells viewed with phase contrast and dark-field illumination for a criminal investigation



Images in transmission with phase contrast showing hemerocallis citrina (long yellow daylily)



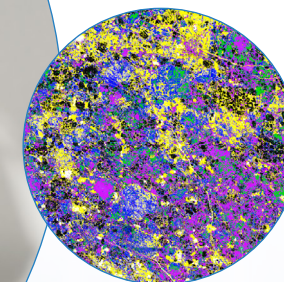
Topography of a structured surface of a rock viewed with ViewSharp 3D



Multi-position objectives turret with automatic reading system to identify the microscope objective

Great variety of hyperspectral imaging features

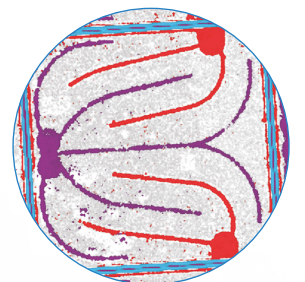
- XYZ 3D confocal image, Z-profile (single-point or plane by plane with QScan™ option)
- Low frequency (30 cm^{-1}) and ultra low frequency (5 cm^{-1}) Raman scattering
- Photoluminescence (PL), electroluminescence, photocurrent, upconversion
- Nanoscale spectroscopy: NanoRaman™ (TERS), NanoPL, and Cathodoluminescence with our AFM and SEM extensions



High definition Raman image of a meteorite cross section



Ultra low frequency Raman and Photoluminescence image of a $\text{WSe}_2\text{-WSSe-WS}_2$ heterojunction structure



Multimodal Raman PL image of a sample of structured gallium nitride (GaN)

A modular and flexible optical microscope

LabRAM Soleil, while very compact, has one of the **largest class 1 sample compartments on the market**. Its ergonomic design allows you to add a range of accessories (micromanipulator, 4-point probe electrical measurement devices, cryostats, incubators, etc.) safely and easily. What's more, its modular design lets you switch from an open-space to an upright configuration in minutes.



LabRAM Soleil: The proof's in the picture

Material and earth science, applications of choice

2D materials

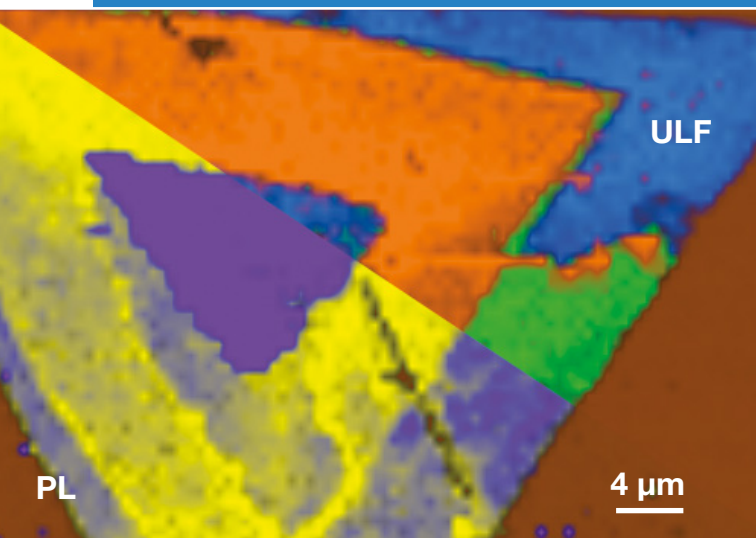
Understanding the limitations of the semiconductors of the future calls for contactless, non-destructive techniques and submicron resolution. The **LabRAM Soleil** has been designed with just that in mind, affording the ability to measure the ultra-low-frequency Raman spectrum and photoluminescence quickly and automatically, thanks to its patented *SmartSampling™* technology. The image shown here reveals growth defects in tungsten disulfide flakes.



**University of La Sapienza, Rome, Italy -
Claudia Fasolato, Research Scientist**

*The **LabRAM Soleil** is so compact, well-illuminated and versatile that you can measure any kind of sample with it!*

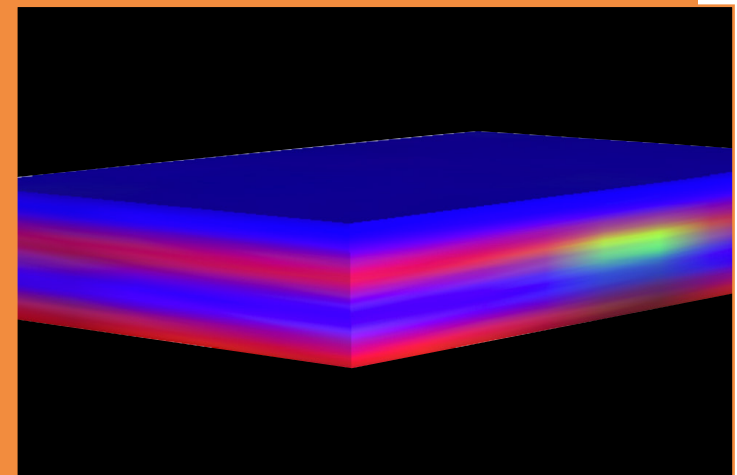
It's the ideal tool for our physics and biophysics research group, where we're working on a wide variety of applications from nano-objects to perovskites and biological samples.



Correlated PL and ULF Raman microscopies of WS₂ sample

Multilayer polymers

Multilayer polymer research very often involves characterizing hidden defects buried during the process, or analyzing interface issues. Here, thanks to the **LabRAM Soleil's** unique *QScan™* technology, the analyst can quickly generate a confocal 3D map using a large XY laser lightsheet (100 μm x 100 μm) and excellent confocal performance in the Z direction (1 μm). Any artifacts or air bubbles buried in the matrix are rapidly detected and can then be analyzed in finer detail using the same tool in microspot mode.

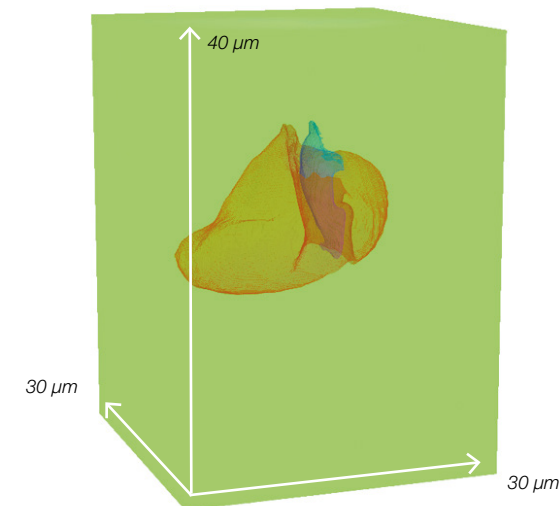


Multilayer polymers with buried artifacts mapped with QScan

Confocal 3D imaging of an inclusion

Confocal Raman microscopy is used in geochemistry and petrology to analyze components trapped in fluid, gaseous or solid inclusions in minerals.

Here, our experts have detected traces of water and carbon dioxide in a sample of quartz. The CO₂ concentration and the presence of its liquid and gas phases, as well as their uniformity, provide key information to help the geochemist gain more insight into the environment and the quality of surrounding minerals. The **LabRAM Soleil's** confocal capability and mechanical stability enable it to obtain a 3D image in very high definition (2½ million pixels, inclusion of 30x30x40 μm³).



2.5 M pixels of high definition image of a fluid inclusion in a quartz matrix

LabRAM Soleil: The proof's in the picture

Serving every kind of life and environmental science applications

Pharmaceutical tablet

Raman microscopy, combined with multivariate analysis, is used to characterize the distribution of active principles and excipients in medicines. Here, a tablet containing 8 components has been mapped in minutes, to be able to guarantee the mixture is homogeneous.

Pharmaceutical tablet compounds distribution based on Raman spectral mapping from low to high concentrations (0.1% to 100%)



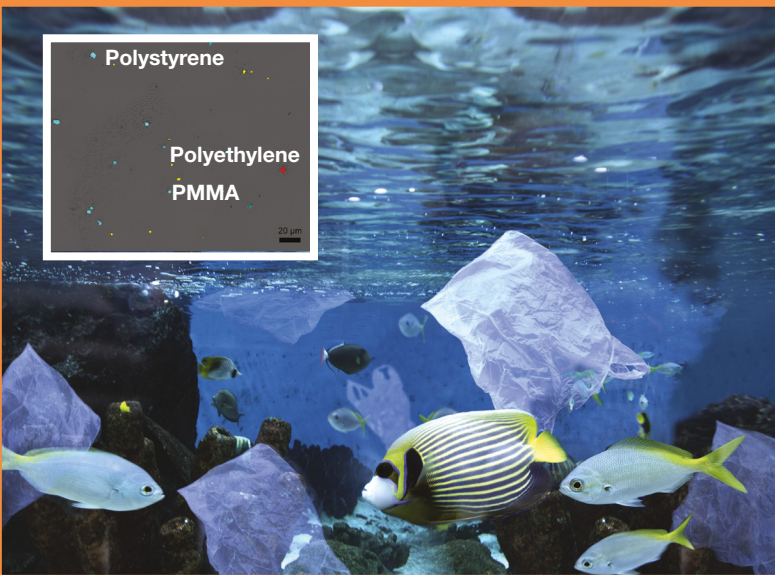
VIBRA-SANTÉ HUB, Center for Interdisciplinary Research on Medicines, Liege, Belgium – Eric Ziemons, Director

*With a multimodal Raman microscope as easy to set up as the **LabRAM Soleil**, we were quickly up to speed. We were able to study our pharmaceutical samples safely and without risk of contamination as it has Class 1 capability built in.*

It's the ideal tool for the analyst of the future!



Microplastics sorting down to the μm scale
PMMA (yellow), Polystyrene (blue), Polyethylene (red)



Microplastics

Raman microscopy is more effective than Fourier transform infrared (FTIR) microscopy for detecting particles smaller than $10\ \mu\text{m}$, making it the ideal technique for analyzing microplastics, whether from the natural environment or in bottled water. In this example, we can see just how fast analysis with the LabRAM Soleil is. Thanks to Mosaic and ParticleFinder apps, analysis of thousands of particles on large filters can be fully automated. LabRAM Soleil fully automated laser switch limits the impact of the fluorescence background (stemming from organic impurities, colouring agents and other additives) which often overshadow the Raman signals and prevent identification of the underlying polymer.

IFREMER, Brest, France – Maria El Rakwe, Research scientist

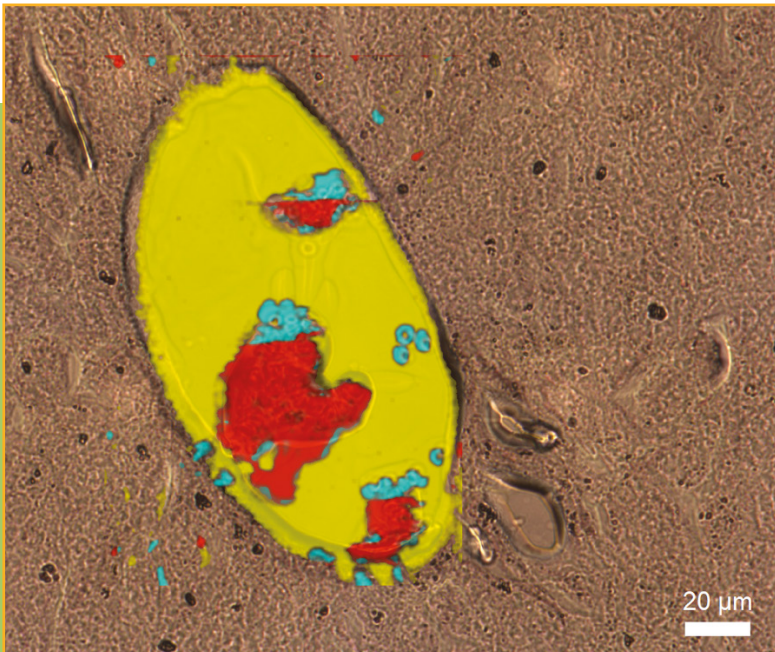
*We really like the **LabRAM Soleil's** optimized design, which speeds up analysis of microplastics. It has helped us to improve our profitability, no matter what kind of environmental sample we're looking at (notably water).*



Cell imaging

Studying how cells work is of fundamental importance in cellular biology, and involves looking at them individually. Raman spectroscopy achieves this feat in combination with confocal microscopes, revealing the physiological dynamics and interactions of cells in vitro, where conventional techniques can only obtain a mean value for a population. Raman spectra offer a wealth of information useful to biochemists, such as cell phenotype, by analyzing nucleic acids, carbohydrate, lipid and protein content, etc.

For pharmacology applications, confocal Raman microscopy also reveals where a medicine is present in a cell and allows analysis of nanovectors aggregating on the cell membrane. This technique is quickly becoming established as the standard in oncology, allowing researchers to optimize medical treatment approaches and reduce chemotherapy doses, in particular.



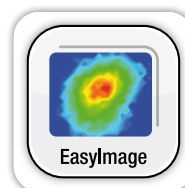
SWIFT high resolution Raman map of a mouse liver cell
(500 ms per point, 500 nm step resolution, 70 000 points)

LabSpec 6: Intuitive Software

Simplicity taken to the next level with *EasyImage*TM



The LabSpec 6 software suite draws on our extensive experience of Raman spectroscopy and imaging, combining ease of use with a range of features configurable to each user's specific needs. And now with its very own App Store, Raman imaging has never been this accessible!



EasyImage, The app that simplifies your workflow!

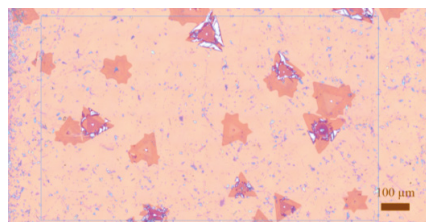
The *EasyImage*TM is a new application developed by our expert teams that draws on HORIBA's know-how in Raman spectroscopy at every step of the image production process, from adjusting the focus to optimization of parameters and interpretation of Raman imaging.



1

Focus

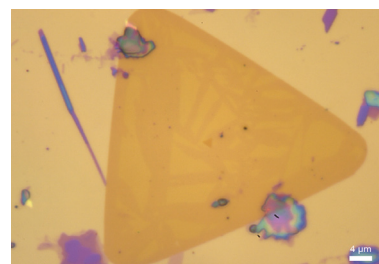
Targeting and focus on point XYZ



2

Optimization

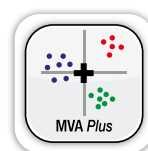
Adjustment of image parameters (contrast, etc.)



3

Characterization

Identification and chemical analysis



Multivariate analysis

A full range of multivariate analysis algorithms (PCA, MCR, K-means, etc.) are built into the software, enabling simplified and automated analysis of chemical components for maximum efficiency.



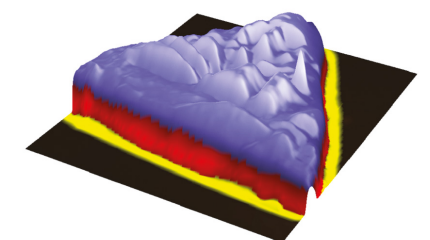
Rapid identification by database

A large choice of databases, including the HORIBA database compiling all our know-how (KnowItAll®) in one place.



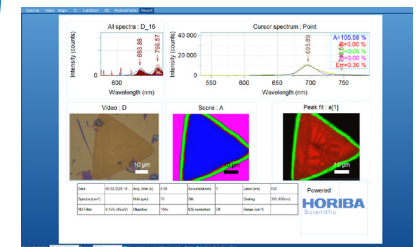
3D Surface and volume

Combining topographic and confocal analysis for 3D imaging



4

Images and interpretation



5

Reports

Infinite customization features

LabSpec 6: Intuitive Software

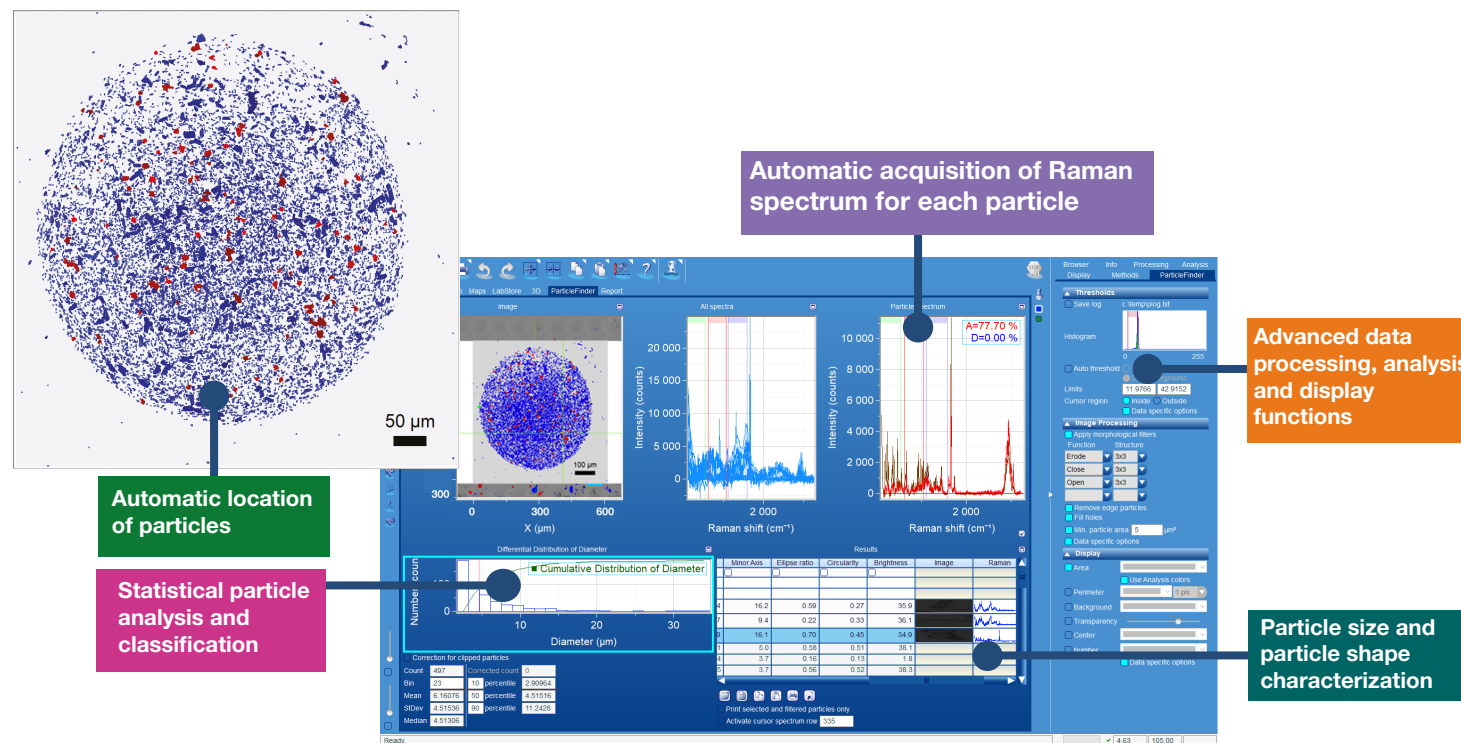
Dedicated apps for your applications



ParticleFinder™ for particle analysis

ParticleFinder performs a comprehensive classification of particles in seconds, combining morphological and chemical analysis.

Typical applications are rapid quality control of microplastics or pharmaceutical substances.



Easy navigation package* for advanced multimodal imaging



NavMap™* is an innovative video feature that shows the global sample and the zoomed region of interest within the sample, simultaneously, in real-time.

NavSharp™* technology delivers sharp and real-time navigation on a sample image with any topography. The surface focus is readjusted automatically with the use of an automated Z sample stage.

ViewSharp™* focus stacking constructs an image in which all surfaces are in focus simultaneously, and creates a 3D topography image. It guarantees the highest focal quality in hyperspectral images, by using the recorded topography which corresponds to

(*) Patented feature



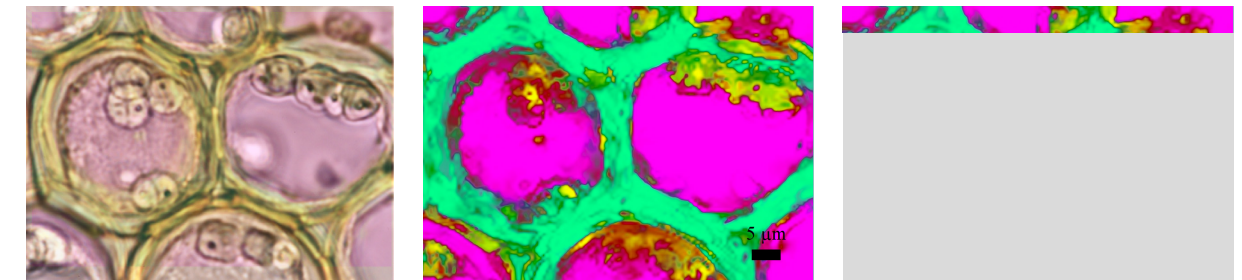
SmartSampling™: Map up to 100 times faster



With HORIBA's patented SmartSampling™ technology added on and the **LabRAM Soleil's optomechanical stability and precision**, hyperspectral mapping is made much faster by an image-compression algorithm. The system intelligently targets points of interest in the sample's and sub-sample's uniform or empty areas.

LabRAM Soleil generates images up to 100 times faster than conventional systems. Such superior performance is made possible by two key advantages:

- The perfect alignment of the laser optical path and its two position-sensitive detectors (PSD),
- The tight calibration of the video image with respect to the laser's position.



Convallaria cell, (left) video image / (center) 14 minutes SmartSampling image / (right) typically equivalent point by point image obtained in 14 minutes



ProtectionPlus™: User profile management and maximum data traceability



- User profiles can be configured and are password-protected
- *AuditTrail* guarantees data traceability at each step in the process
- *ProtectionPlus* assures compliance with FDA 21
- CFR Part 11 and GMP/GLP requirements

LabRAM Soleil, serving your applications

More modularity now and for the future



LabRAM Soleil is both robust and modular. Its optical and mechanical design minimizes vibrations, its optional auto-alignment feature keeps maintenance callouts to a minimum, and its temperature-controlled objectives turret ensures excellent stability over time for precise and reproducible results.

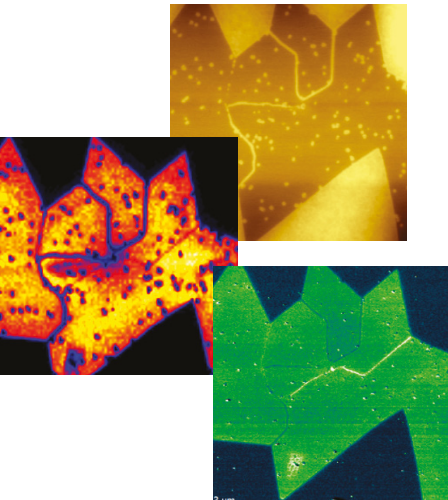
LabRAM Soleil is the most modular microscope in its class on the market today. Adding a circuit board, sensor, imaging system or diffraction grating turret has never been easier. Everything has been designed to ensure quick setup of your initial system and future upgrades, and our global network of customer support engineers is there to guarantee premium service wherever you are.

LabRAM Soleil is easy to maintain with a progressive maintenance plan (3 levels). A dedicated maintenance team will ensure predictive, preventive and curative interventions. The instrument design ensures easy access to all parts to minimize service downtime. We offer a standard **2 year warranty including lasers and detectors**. You can customize warranty conditions and maintenance contract extensions through your local representative.

Get even more out of your LabRAM Soleil by combining it with our Atomic Force Microscope (AFM) and gain access to spectroscopic measurements at the nanoscale

You can easily couple your **LabRAM Soleil** to **OmegaScope**, our **AFM** system available in different controlled environments, allowing you to acquire correlative AFM/Raman/Photoluminescence (PL) and Tip-Enhanced Raman and PL measurements (TERS, TEPL).

See physical (electrical, mechanical, magnetic, etc.), opto-electrical and chemical properties at the nanoscale for a broad range of samples (advanced materials, semiconductors, molecules, thin films, biological samples) with the combination of **LabRAM Soleil** and **OmegaScope**.



Enjoy global support

You can also count on the support and renowned expertise of our applications engineers for advice and training. See our website to learn more about our hardware and software training solutions.

www.horiba.com/labramsoleil

LabRAM Soleil main specifications

Getting *There* Faster

Wavelength range	UV-Vis-NIR	Broadband high throughput achromatic mirror based system, optimized from 300 nm to 1600 nm without changing optics.
Standard laser wavelengths	325, 405, 473, 532, 638, 785 nm	Typical lasers for Raman and PL. Other wavelengths upon request.
Spectrometer scanning speed	Up to 400 nm/s	With 600g/mm grating, mounted on a standard Turbodriven 4-grating turret, for fast Raman, PL and upconversion luminescence spectral map acquisitions.
Number of gratings	unlimited	4 grating exchangeable motorized turret.
Fast Imaging	<1ms/spectrum	SWIFT, SWIFT XS EMCCD, SWIFT repetitive, SWIFT extended Range and SmartSampling for ultrafast imaging.
3D confocal slicing with laser lightsheet illumination	QScan (patented)	Typical 2 µm thick 100 x 100 µm² laser lightsheets for large area 2D/3D confocal imaging.
Low wavenumber cut-off	5 cm ⁻¹	With optional VBG filters, >70% transmission.
Standard wavenumber cut-off	30 cm ⁻¹	With edge filters for 532, 638 and 785 nm wavelengths, injection rejection, > 99% transmission.
High wavenumber cut-off for PL	1600 nm	Scanning Czerny-Turner spectrometer with 2 motorized detector ports for CCD and InGaAs array detectors.
Laser auto-alignment procedure	15 s	Optional ultrafast sample-independent laser auto-alignment allowing remote maintenance.
Built-in lasers	Up to 4 solid-state lasers	NUV to NIR wavelengths available.
External lasers	Unlimited	For large gas and ultrafast lasers typically.
Spectroscopic motorized modalities	Up to 6 laser filters	Raman, PL, ULF, Upconversion luminescence...
Rayleigh filter orientation	Individual filter computer controlled	Factory preset & user adjustable angle to adapt with sample reflectivity.
AFM / SEM coupling	Yes	Built-in horizontal exit for direct Atomic Force microscope coupling, optional fiber entrance for SEM coupling with RCLUE.
Operating temperature range	18-28 °C	Non condensing
Dimensions (W x D x H in mm) Weight (kg)	898 x 797 x 806 120 kg	~1 cubic meter, including lasers, CDRH enclosure, electronics and cooling to save space in your laboratory
Power consumption	< 600 W for a fully loaded configuration	Eco-friendly and safe design, with built-in class 1 enclosure, low power consumption electronics and cooling, 1 power cable EU / US type

Contact Us

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Worldwide Training and Technical Support

HORIBA Jobin Yvon, established in 1819, and now part of the HORIBA Scientific segment, is one of the world's largest manufacturers of analytical and spectroscopic systems and components.

The HORIBA Scientific teams are committed to serving our customers with high performance products and superior technical support.

Our staff of experienced application and service engineers, located around the world, provides full support for your instrument.

Well equipped application laboratories allow for sample analysis and hands-on training for new and experienced users.



Find out more at www.horiba.com/labramssoleil



CLASS 1 LASER PRODUCT

