Specifications and equipment are subject to change without notice or liability on the part of the manufacturer.

WEVE CORPORATION
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RAMAN MICROSCOPE

MantaRay

ES France - Département Bio-tests & Industries
127 rue de Buzenval BP 26 - 92380 Garches

Tél. 01 47 95 99 90

e-mail : bio@es-france.com
Site Web : www.es-france.com

We support your research.

Raman Spectroscopy is a versatile, non-destructive chemical analysis technique that usually requires no material preparation, provides detailed information about chemical structure. MantaRay is the most optimized equipment that can perform these Raman properties fastest and accurately, and will be the most suitable equipment for ant field that requires Raman spectroscopy research.

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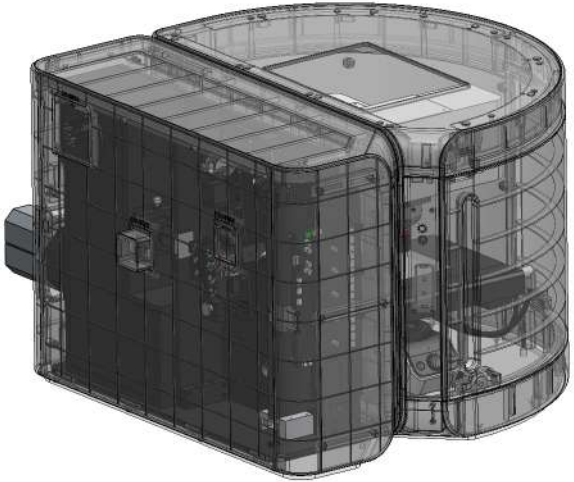
Why MantaRay?

MantaRay minimizes accuracy distortion by aberration-compensated spectral design. The built-in calibration standard lamp and automatic calibration algorithm (patented) ensure the initial measurement settings are preserved.

High reproducibility of measurement results are secured by dual-head rotary encoders with less than 0.003 degrees of error, easily replaceable gratings, built-in silicon sample and guide beam.

The path of laser is optimized for the shortest distance which directly influences sustainability and reliability. For simpler management, maintenance, and increasing mechanical stability minimalized design was applied.

Measurement stability



A sample measuring microscope is enclosed in a case to ensure laser safety and prevent interference with ambient light. Laser is constantly monitored with an optical camera and the measuring position is managed with sub-micrometer accuracy by a specially designed electronic control unit.

The sample measurement and spectrometry detector are completely separated for simpler maintenance and scalability.

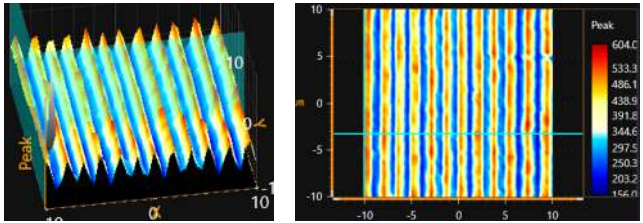
The design of MantaRay allows simple replacement of consumables (neon lamps, gratings, polarizers) and easy adjustment of the laser alignment.

High sensitivity, Spatial Resolution

- **Sensitivity Data**

The quarter spectral signal of silicon is a representative way to describe the sensitivity of a Raman spectroscopy system, and the signal above was measured with a standard-grade spectroscopic CCD instrument.

- **Spatial resolution Data**



Mapping image of optical grating
(600gr/mm) (40 x 40 pixel, 0.5 um step)

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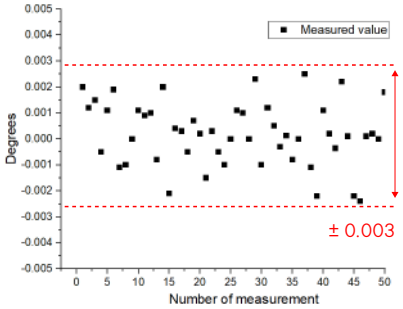
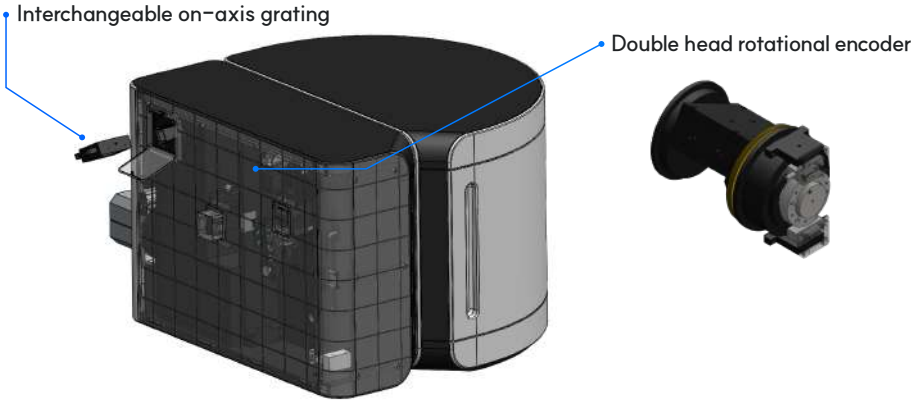
Measurement Repeatability

WEVE Raman spectrometer is equipped with interchangeable gratings that can be easily replaced by the user. Precise control of the grating rotation angle is required to achieve accurate measurement and reproducibility. The internal guide beam and double head rotational encoder provide excellent measurement reproducibility and accuracy compared to conventional Raman spectrometers.



Encoder RMS error over 50 times = ± 0.003 degrees. Rotation accuracy of the grating measured over 50 repeated measurements.



Spectral Repeatability

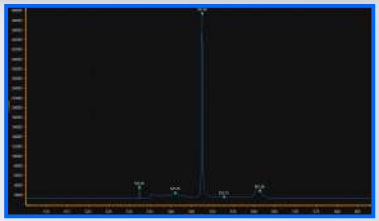
MantaRay synchronizes with an integrated guide beam to maintain the accuracy of grating rotation and ensures long-term measurement reproducibility regardless of gratings being replaced or added.

CCD pixel RMS error < 0.5 pixel
Repeated measurement results for center (A) and left (B) right(C) of the CCD

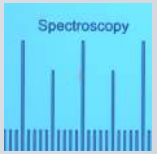
* X : 520.73 / counts : 35840, X : 520.06 / counts : 39373, X : 520.06 / counts : 35387

Built-in standard sample

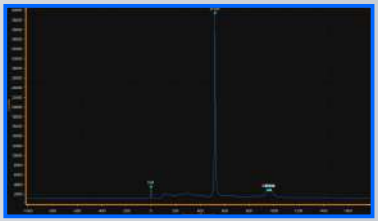
Easy grating replacement and measurement reproducibility with internal guide beam and built-in silicone sample



Silicon 1st (nm)



Rayleigh calibration by built in standard(automatic)



Silicon 1st (cm^{-1})

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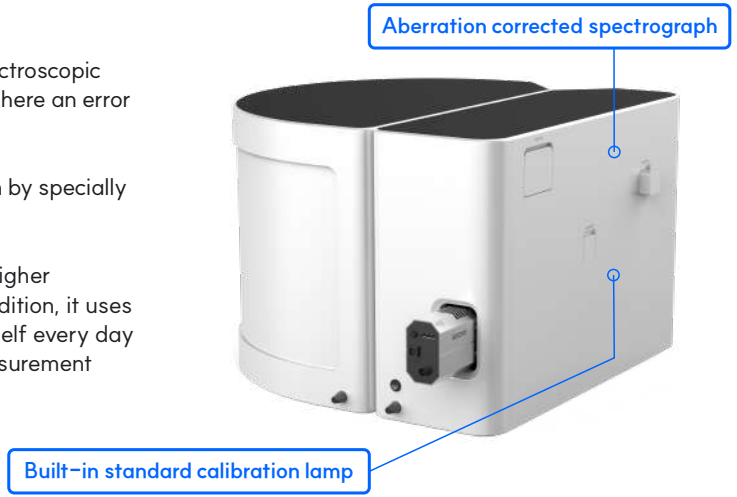
Measurement Accuracy

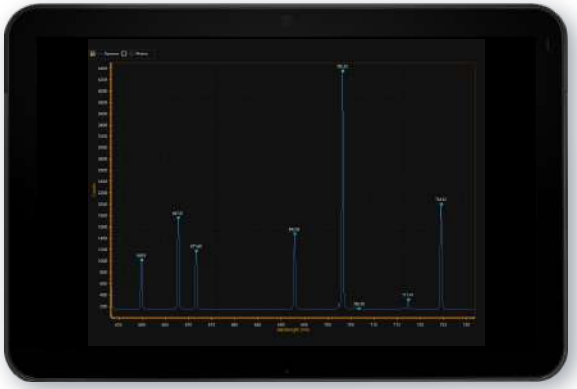
The aberration-corrected spectrometer and high-speed auto-calibration technology enable improved measurement efficiency and superior measurement accuracy by overcoming optical and mechanical limitations of conventional Raman spectrometers. Built-in Neon calibration lamp allows the system to keep the settings without additional calibrations using automatic proprietary calibration algorithm of WEVE.

- Spectral accuracy is the most important factor in spectroscopic measurement, especially in Raman measurements, where an error of just one pixel can prevent accurate analysis.
- Traditional techniques may require regular calibration by specially trained technicians to maintain accuracy.
- WEVE's EverCal technology provides an inherently higher calibration than traditional calibration methods. In addition, it uses a built-in neon gas lamp to automatically calibrate itself every day without user intervention, maintaining sub-pixel measurement accuracy across the entire area of the CCD



Neon calibration lamp DATA

1200gr/mm Grating
0.08nm/pixel resolution
RMS error over 10 spectral lines = 0.0195nm



600gr	585.249	607.434	621.728	659.895	692.947	724.517
Maesured	585.23	607.42	621.72	659.9	692.96	724.53
Error	−0.019	−0.014	−0.008	0.005	0.013	0.013
1200gr	659.895	667.828	671.704	692.947	703.241	724.517
Maesured	659.89	667.82	671.71	692.94	703.25	724.52
Error	−0.005	−0.008	0.006	−0.007	0.009	0.003
1800gr	603	614.306	621.728	633.443	638.299	640.225
Maesured	603	614.31	621.73	633.44	638.3	640.23
Error	0	0.004	0.002	−0.003	0.001	0.005

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Application

MantaRay can be used in various research fields such as environment, energy, materials engineering, biomedicine, sensor development, photocatalysis, solar cell development, plasmonic microparticle development, LED inspection, microplastics, carbon dioxide capture & utilization, etc.

Sensing

- Biosensor (SERS)
- Plasmonic biosensor(nano architecture based)
- Polymer– nanomaterial compound
- Micro plastic

Battery & energy

- Organic electrode
- Metal oxide
- Carbon material(graphite)
- Electrolytes (solid, acqueous)
- Polymers / ceramics, metal–alloys
- Solar cell/Photoelectrochemical cell
- Energy storage – carbon capture & utilization

Display

- Graphene, 2D nanomaterial, epi thin film– Micro LED & Nano LED
- Quantum dot / OLED, QLED, PeLED

Catalysis

- Electrocatalysis /metal compound NPs : Chlor–Alkali industry)
- petroleum refinery)
- Battery
- Plastic recycling
- Photocatalyst – Fuel cell

Semiconductor

- SemiconductorSemiconductor Devices (Low–Dimensional, Compound Semiconductors)
- MoS2, WS2, MoTe2, WTe2, MoSe2 / III–V compounds

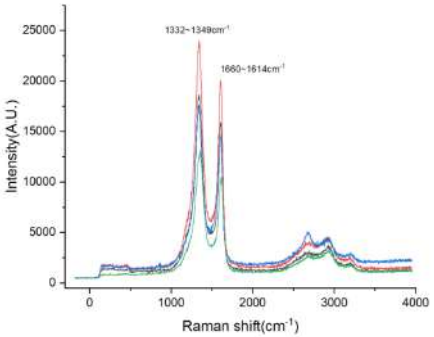
Carbon materials

- Graphene & graphite film – Transparent electrodes/Batteries/Catalysts/Semiconductor devices, Transistors

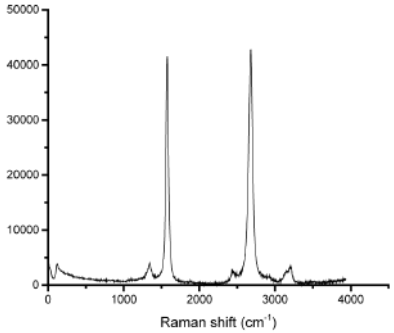
▪ Application spectrum

Carbon material

Activated charcoal

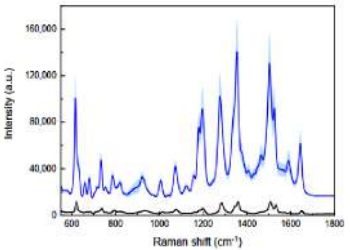


CNT fiver



SERS effect

Rh B on si based(black) vs AuNP / Si(blue)



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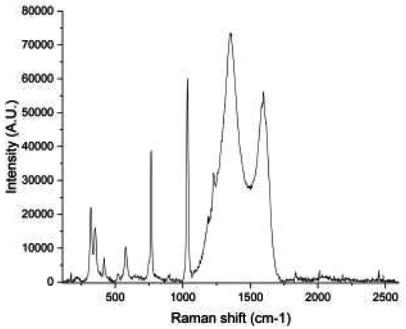
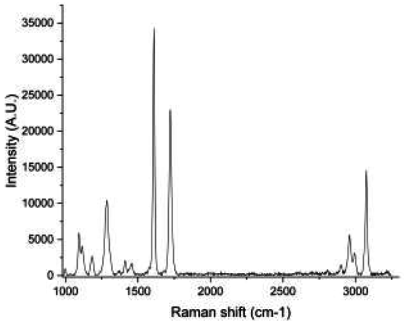
▪ Application spectrum

Battery, Plastic

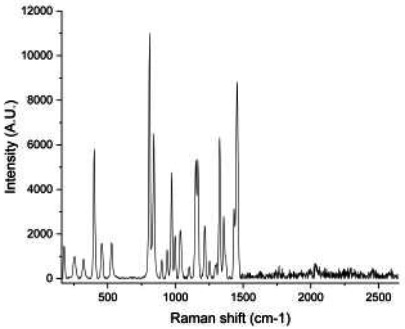
In-situ raman monitoring of Metal ion battery



PET(Poly Ethlylene Terephthalate)

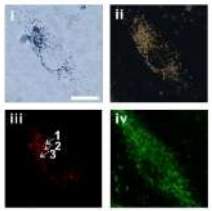


PP(Poly Propylene)

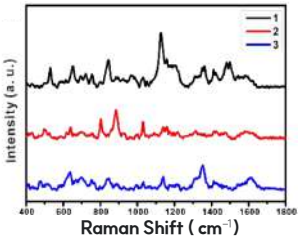


Skin, Cell and tissue

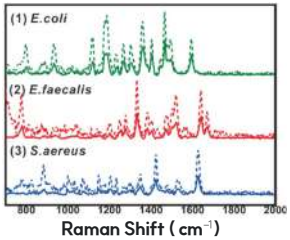
A.



B.



C.



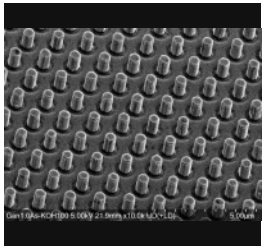
A. Bright, Dark field, Raman mapping and fluorescence images

B. Raman spectra from inside cells

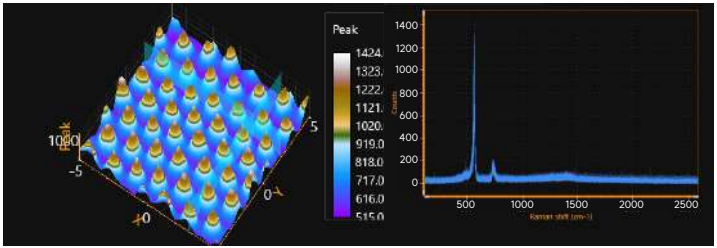
C. Raman spectra of Bacteria DNA

Display and LED

A.



B.



A. SEM image of Nano LED(GaN)

B. Raman mapping image(L) and Spectrum(R) of Nano LED(GaN)

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System Configuration

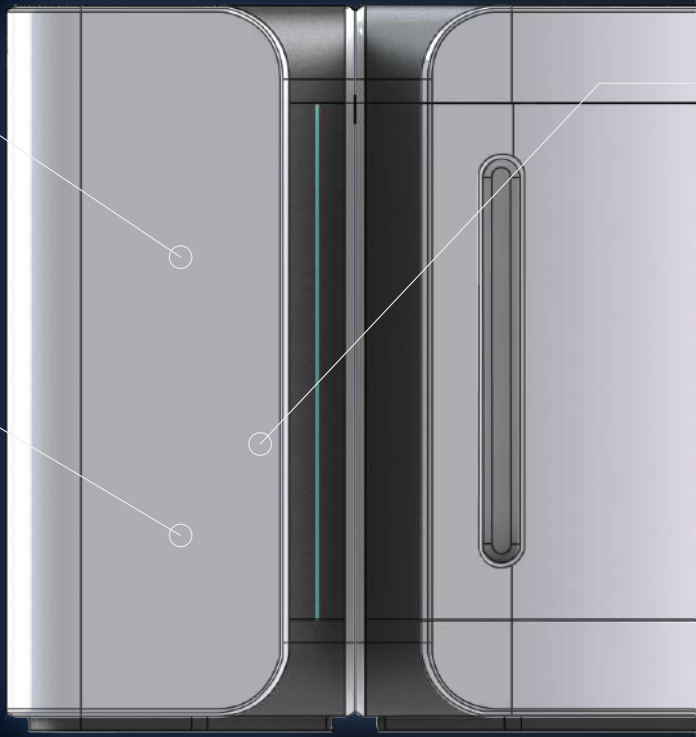
01
Spectrometer

Wavelength range : Optical aberration and distortion free from UV to NIR bands are available.

Number of gratings : Implementation of various gratings in UV and NIR bands is possible due built in automatic correction functionality.

02
Input light

Laser wavelength options : 325, 405, 532, 633, 638, 785nm (Built in, External, Up to 3)



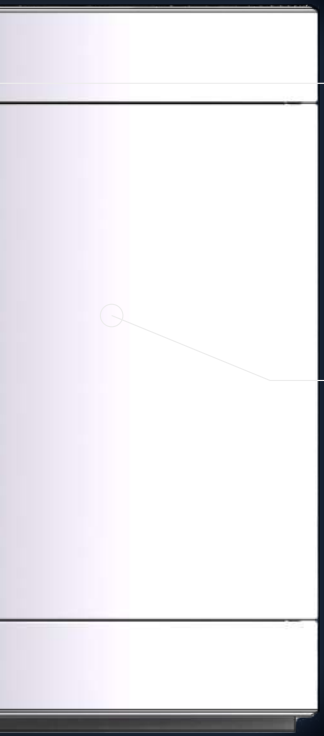
Accuracy

Built-in standard neon lamp and constant automatic calibration thorough position control system, provide the highest level of accuracy and reproducibility to the aberration-corrected spectrometer. (~0.04nm)

Stability

Design is optimized for minimal repositioning of optical compo-nents which significantly improves the reliability and lifetime of the equipment.

FICATION



03
Main body

Low wavenumber cut-off : <50 cm^{-1} : depending on laser wavelength

High wavenumber cut-off : 5,000 cm^{-1}

04
Detector

Detector size : 1024 X 256 pixels (standard) : other options available

Detector operating temperature : −100 °C (max)

05
Optical Microscope

Axial resolution : <1um
Lateral resolution : <2um

06
Controls

Latest Windows OS : SWs (operating, off-line analysis, database & identification)

Convenience

The system is able to diagnose its performance using embedded standard silicon . Detachable design and simplified part exchange allows quick and convenient parts exchange and calibration if needed.

Scalability

Depending on the application field, image options such as Bright & Dark field, DIC can be added. Various measurement conditions are supported as well (temperature, electricity, pressure, polarization, chemical reactions,Hyper spectral, etc.).

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Detailed Specification

Category		Desciption
General Performance	Raman Shift Range	From 50cm^{-1} @ Low wave cut-off filter to 4500cm^{-1} or higher) 80cm^{-1} @ > 50% edge steepness
	Spectral Resolution	Average [0.07 nm / CCD pixel @ 1200gr/mm, 650 nm] [~ 1cm^{-1} @ 2400gr/mm] [0.2cm^{-1} / pixel @ HRS(high resolving) mode]
	Spectral Accuracy	<0.04nm @2400gr
	Designed Spectral Range for PL	185 ~ 2,400nm (or higher)
	Detecting Coverage	One single continuous acqusition from 50cm^{-1} ~ 4000cm^{-1} (or more) with high resolution (<1cm^{-1}) without step and stitch work
	Spatial Resolution	Around 1 um (lateral) / 2 um (axial) or better laser spot diameter : smaller than 600 nm @ 532nm, optimized design for 100x objective lens
	Auto Calibration	Grating, lamp, laser path alignment & wavelength calibration
Input Light	Wavelength	325, 405, 532, 633, 638, 785, 830 nm Up to 3 lasers (Built-in, External)
	Output Power (@aperture)	25mW ~ 170 mW
	Mode	Single longitudinal
	Power Srability	1~3%
	Spectral Line Width	0.001 ~ 0.00001 nm

Category		Desciption
Spectrograph	Aberration	Aberration corrected spectrograph (minimum astigmatism over 700 nm at 2400gr/mm grating)
	Focal length	250nm
	Grating	1200gr/nm as a standard (on-axis interchangeable unlimited grating turret replacement)
	Measurable	200nm to 1050nm by CCD detector
	Scan to scan repeatability	better than 0.05cm^{-1}
Detector	Cooling	TE cooled down to - 70 DC (with chiler) / -100DC(Water) -55DC (Air cooling) suitable for both Raman PL
	Pixel format	1024x256 pixel, sother higher available on request
	Chip size	26.6x6.6mm (26x26microns)
	Spectral range	200nm (or less) to 1050nm (or more)
	Dark noise	0.0014 e-/pix/sec at min. temperature.
	QE	>55% (MAX)
	Interface	USB interface, 220-230VAC single phase
Application	Laser illumination	Raman, PL, Up-conversion
	Microscope image	White light image, Dark-field, DIC

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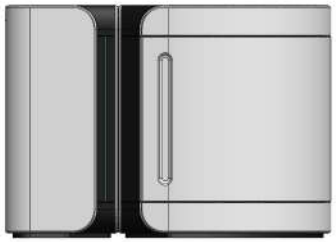
Options, Accessories

Optional

MantaRay
Standard Weight 100 kg

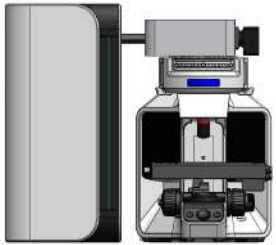


W 681mm

Material science

- metal oxide, carbon materials, polymer
- In-situ monitoring (catalysts, electrode material)
- Plastics, Metal Nps
- Mineral carbonation(CCU)
- Functional materials

MantaRay
Fusion Weight 90 kg

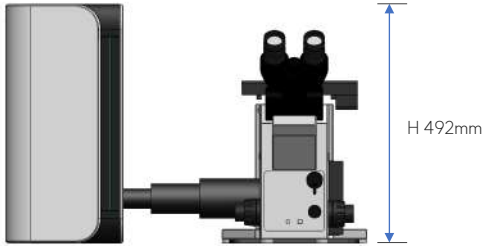


W 539mm

Open space

- Electrocatalysis
- Display
- Fiber recycling (nano fiber)
- Engineering alloy design
- Cryostat & electrochemistry cell

MantaRay
Inverted Weight 90 kg



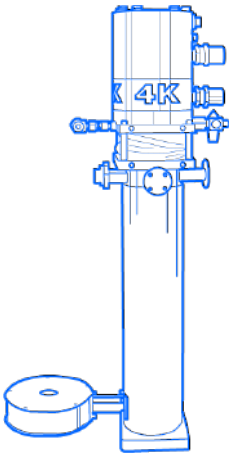
W 700mm

Bio application

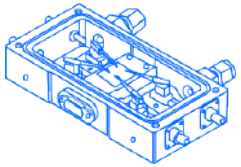
- Bio-sensor, bio-imaging (bio marker)
- Live cell monitoring (incubator)
- SERS

Utilize a variety of Accessories

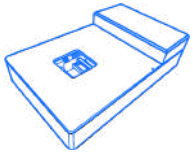
Depending on the measurement conditions and research direction, different versions of the spectroscopy system and accessories are available.



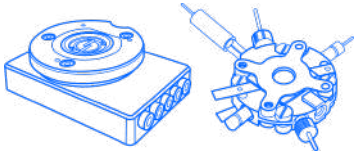
- Cryostat (low vibration) down to 4K



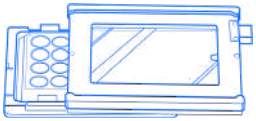
- Micro Probe-station*



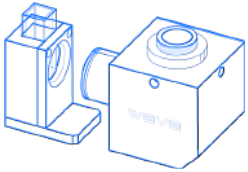
- Tensile test stage



- Electrochemical test cell



- Incubator

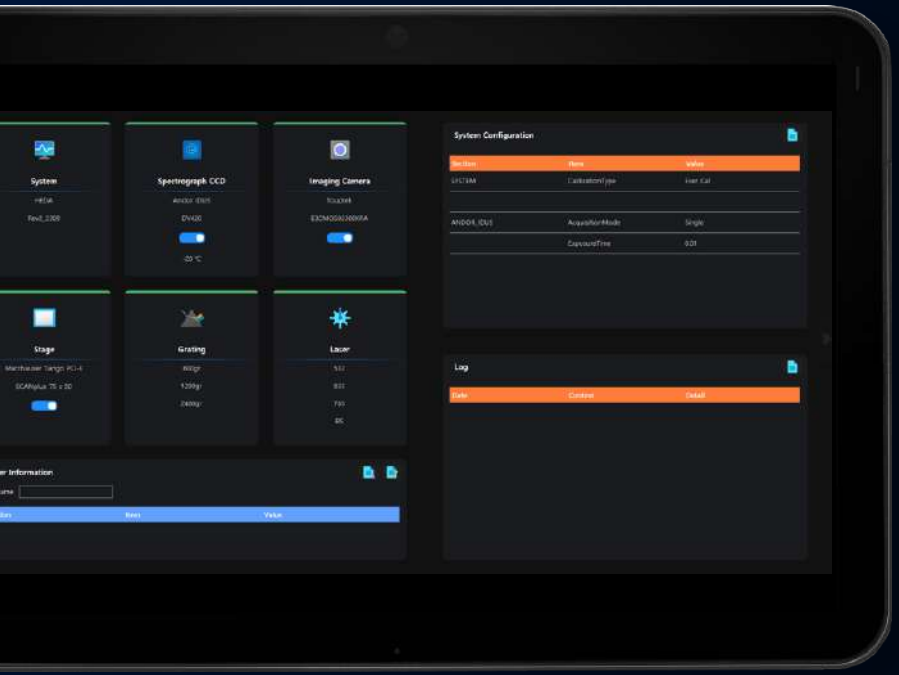


- Objectives for Liquid Samples

*** Micro probe-station**

For Electroluminescence, Photocurrent and Temperature dependent experiment

Control Software : Rays-ON



MAIN UI

- Know the connection status of each device
- Control on-off connections
- Individual user log-in
- Fast and easy maintenance
- Open & save log & config file
- Quick guide attached

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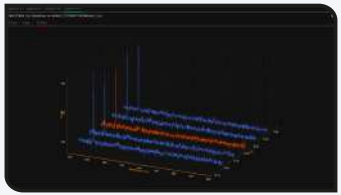
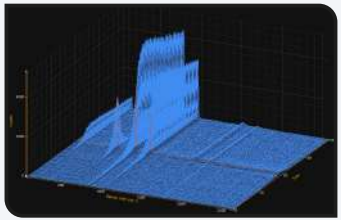
Various data display methods

2D spectrum display in time and depth

In-situ monitoring , changes in composition and structure of samples



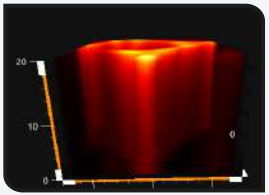
The study of reaction mechanisms by observing changes in external conditions (physical, chemical, electrical) or changes in spectra over time.



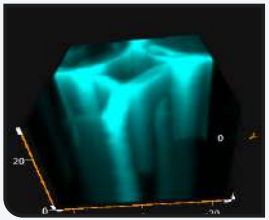
Characterize a sample by observing its spectrum as a function of depth

3D mapping Stack & rendering view

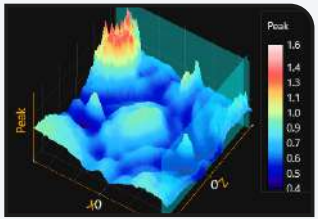
Display the 2D spectrum image of the sample by display by depth (based on wavelength, intensity, half-width, integration)



2D Stack view image



3D Rendering image



2D spectrum image by peak int

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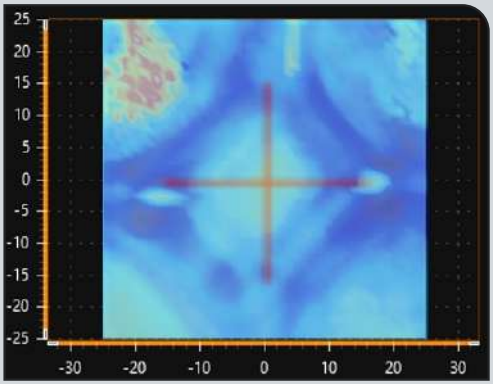
Various data display methods

Overlap



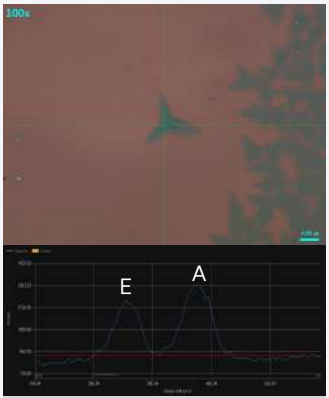
Spectrum and optical image with the same wavelength and measurement area displayed at once. Display a spectrum image and an optical image with the same measurement area simultaneously.

It is possible to overlap or separate Spectrums on a single screen, displaying as individual colors with different measurement information.

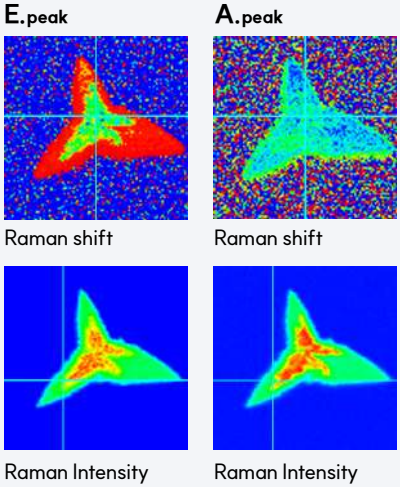
Data processing and analysis

ROI

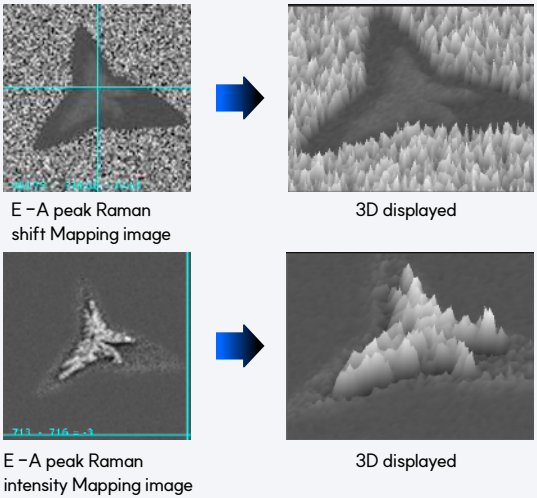
2D representation of specific peaks with information such as half-width, intensity, wavelength, etc.



Optical image & Raman spectrum of MOS2



Wavelength, intensity, half-width, integration in 3D.



Arithmetic operation: Representation of calculated values such as ratio, sum, etc. of wavelength, intensity, half-width information of two or more peaks

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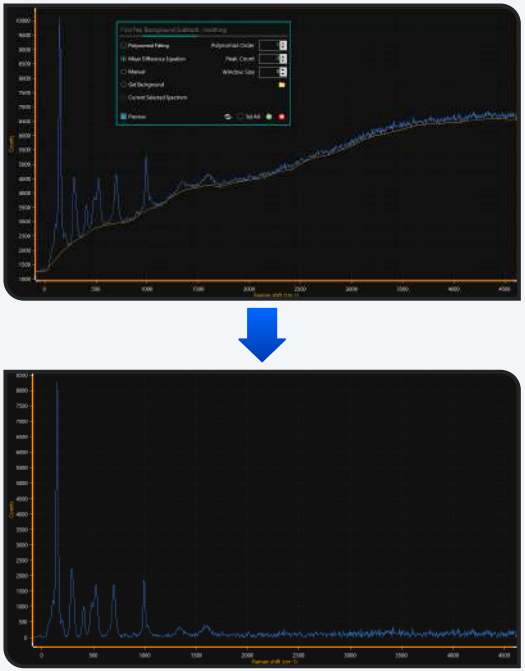
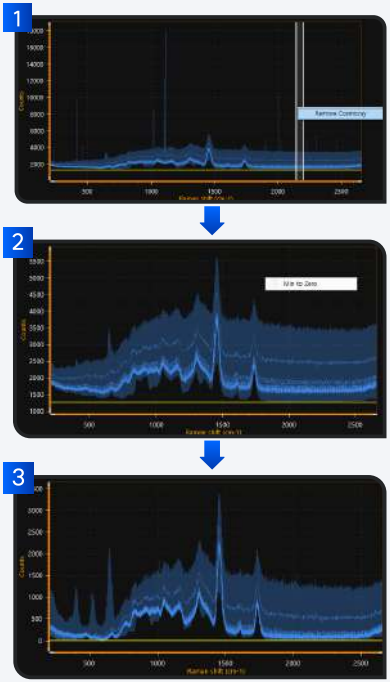
Fitting (Polynomial , Mean difference & manual) and smoothing

Background removal



Cosmic ray, background removal in mapping spectrum chart



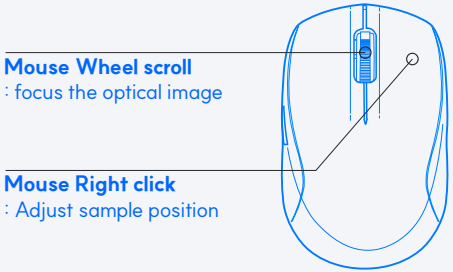
1 Remove Cosmicray

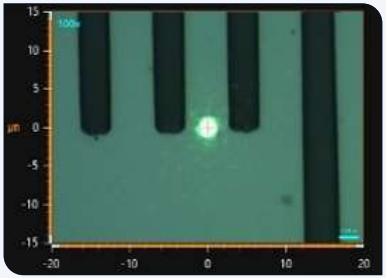
2 Min to Zero

With the above process, you can easily remove the cosmic ray and background from the mapping spectrum chart.

Usability and user-friendly controls

- Mouse control : Adjust sample position (mouse click), focus the optical image (wheel scroll)
- Position save : Save sample measurement location information
- Objective lens position correction : Compensating for position error due to microscope optical lens magnification
- Multi point scanning : Specify measurement positions to save automatic measurements of signals and optical images
- Guide beam (for easy adjustment of the optical image of the sample's surface)





Example guide beam image

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Dedicated viewer

Dedicated viewer " WeVu "

Data measured with WEVE's MantaRay and StingRay can be further analyzed using the dedicated viewer WeVu.

1.Back subtraction

- Polynomial fitting
- Mean difference Eq
- User defined

2.Selectable Data format

- Microscopic image
- Spectra signal
- Mapping image

3.Data display window

- Bright field/Darkfield image
- Single/Multi spectrum
- Color display
- Creative 2D color mapping image

4.Signal processing

- Average
- Mean
- Smoothing

5.Peak finder

- Set peak count number
- Control interval value

6.ROI analysis

- Max intensity
- Center wavelength (wave numver)
- FWHM
- Integration

MantaRay

Brochure

Specifications and equipment are subject to change
without notice or liability on the part of the manufacturer.

WEVE

Closer view of the brighter future

The images used in this brochure are based on MantaRay rendered images. In addition, the images of the software UI, etc. were created with the actual operating screen of Rays-ON, our in-house developed software. The actual images may differ slightly from the contents of the brochure.

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