SPIROX

SOUTHPORT

SP8000A

Laser Scanning Confocal Measurement Development Platform

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01

Features

- SP8000A Features
- Confocal Principle
- Advantages

SP8000A

SP8000A is a development platform for optical measurement solutions, featuring a built-in optical microscope and utilizing laser scanning confocal technology. This platform supports the integration of various optical accessories and modules according to measurement requirements, enabling diversified research and measurement. It enhances the flexibility of R&D equipment, reduces the cost of capital expenditure during the R&D phase, and shortens development time.

Features

- Patented optical non-destructive measurement.*
- Utilizes laser confocal technology with a resolution of up to 0.1 μm.
- High-sensitivity PL/Raman spectroscopy measurement.
- Rapid PL image generation.
- 3D imaging capability.
- Movable spot mapping function.
- Customizable measurement kits to meet specific measurement requirements.
- Surface topography measurement functionality.
- Highly integrated software seamlessly compatible with mainstream spectrometers (Horiba / Andor / Ocean) and multiple SMUs (Keithley / Keysight).
- Built-in basic dimension measurement functions, capable of measuring length, angle, diameter, and more.

*Patent Certificate Number: TW I661222 B

SP8000A

Advantages

- Patented non-destructive measurement* reduces sample damage caused by the heat accumulation from rapidly oscillating the excitation spot within a micro-area.
- Flexible functionality with both single-point and scanning measurement modes, supporting diverse development applications such as spectroscopy, fluorescence imaging, and surface topography measurement.
- Multi-light source switching, supporting up to four lasers.
- Programmable control and modular switching allow users to define platform functions, simplifying and streamlining the operation experience.
- Optional polarization detection module.
- Optional large 205mm x 205mm motorized platform.
- Software supports integration with Horiba / Andor / Ocean spectrometers and Keithley / Keysight SMUs.

*Patent Certificate Number: TW I661222 B

Benefits

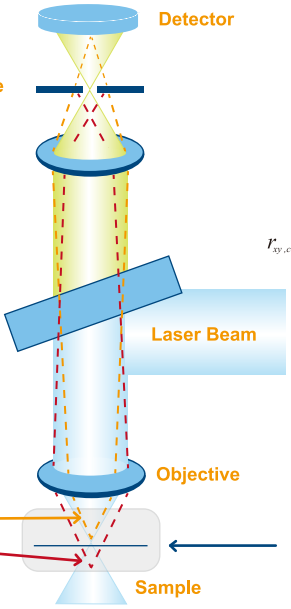
- Freely configurable measurement modules to meet specific needs, enabling effective cost control.
- Consolidates multiple functions into a single machine, reducing redundant investments.
- Easy to operate with a low learning curve and minimal dependency on operator expertise.
- Precise measurements accelerate R&D progress and shorten time-to-market.
- Enhances material quality control, such as IQC.

Confocal Principle and Its Advantages

Scanning Laser Confocal Technology

- Point-by-point scanning and light collection ensure adjacent signals do not interfere with each other, delivering precise measurements.
- Confocal technology effectively isolates signals before and after the focal plane, enhancing measurement accuracy.
- Short depth of field with high Z-axis precision ensures superior accuracy in depth measurements.
- Optical slicing and 3D image reconstruction provide an intuitive view of the spatial distribution of signals through 3D visualization.
- Single-point targeting function enables precise positioning for accurate measurements.

The Principle of Confocal



The ideal size of pinhole is an AU (airy-disk unit) which was depend on the conditions of optical devices arranged in the path, including tube lens, objectives.

Convenience Microscope:

$$r_{xy} \approx \frac{0.61\lambda_{em}}{NA} \qquad r_z \approx \frac{2\lambda_{em}\, n}{NA^2}$$

Confocal Microscope:
(pinhole size: 1AU):

$$r_{xy,confocal} \approx \frac{0.4\lambda_{em}}{NA} \qquad r_{z,confocal} \approx \frac{1.4\lambda_{em}\, n}{NA^2}$$

↑ 34% ↑ 30%

λ^{em} Emission wavelength
NA Numerical aperture
n refractive index

Signals from above and below the plane of focus fall outside the pinhole and are blocked.

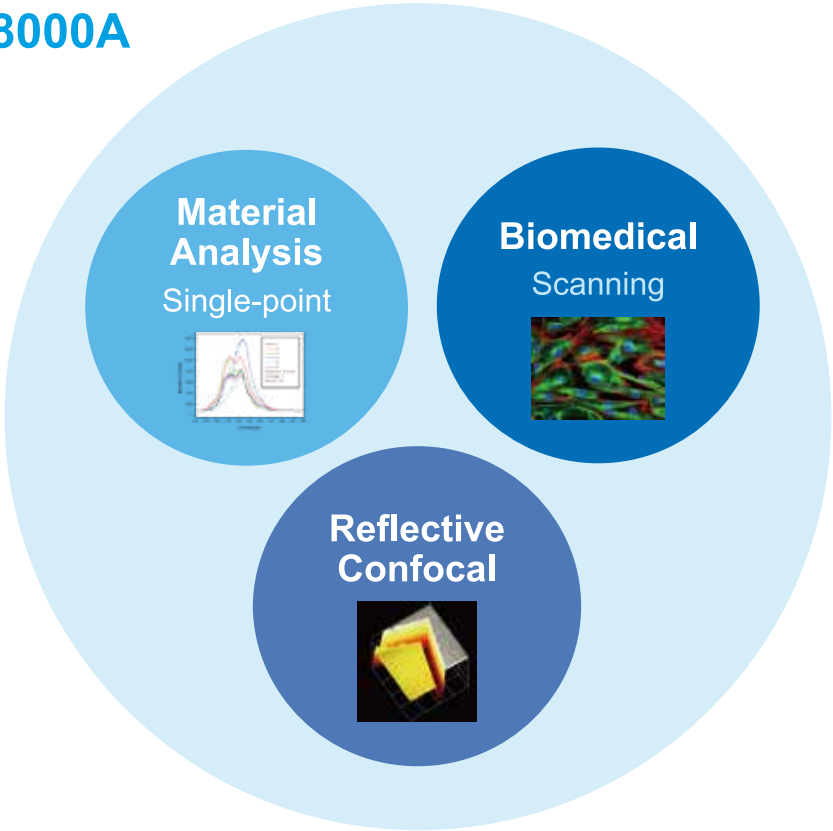
Only signals from plane of focus pass the pinhole and are detected-producing a “optical section”

A Development Platform That Does More

**More than just a single-function instrument,
SP8000A offers diverse and versatile measurement capabilities.**

Traditional confocal microscopy is divided into two measurement modes: Single-point mode (used for conventional material analysis) and Scanning mode (used for biomedical imaging). SP8000A integrates both modes and supports modular expansion to unlock additional functionalities, such as surface topography inspection and spectral measurement. With different module configurations, SP8000A can deliver a wide range of variety measurement capabilities.

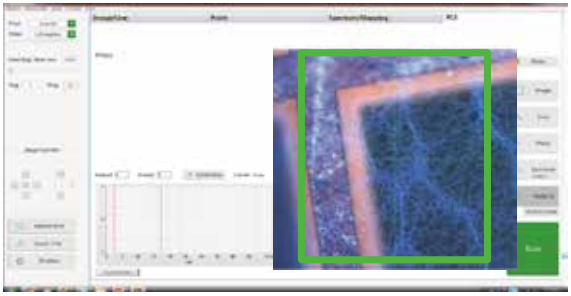
SP8000A



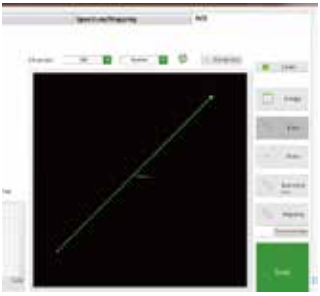
Software Advantages

- Patented microarea light spot perturbation for non-destructive spectroscopy measurement.
- Pioneering ROI measurement to measure exactly the area you see (with interface icons).
- Intuitive and easy-to-use Graphical user interface.
- Supports leading brand spectrometers (Horiba / Andor / Ocean).
- Supports temperature control systems (LinKam / Lakeshore).
- Supports SMUs (Keithley / Keysight).
- Programmable XYZ platform movement.
- Basic analysis and measurement: displays peak value, peak intensity, and ROI range after mapping.
- Customizable Functions.
- Provides SDK for development.

ROI Measurement: measure as you see

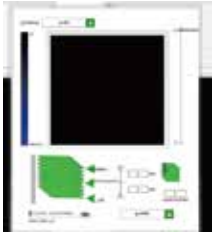


Sample length measurement

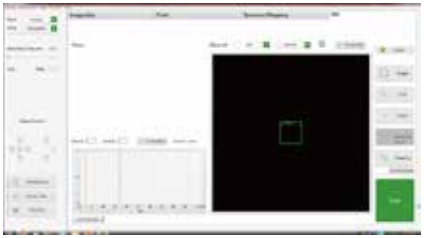


Select spectrometer model

Depth-scanning configuration



Non-destructive spectroscopy measurement mode



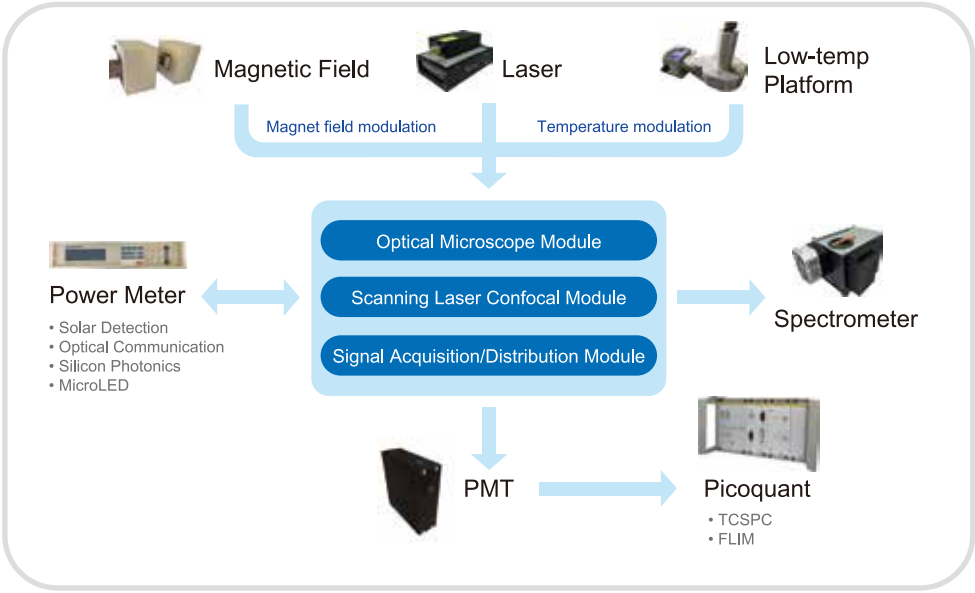
02

Application

- Functions and Applications
- Applications of Other Reflection Modes

Functions and Applications:

A Symphony of Acoustics, Optics, Electricity, Heat, and Magnetism



Raman / PL Spectroscopy

1. Jewelry authentication
2. Drug identification / forensic analysis
3. Environmental toxicology testing
4. Art and antiquities authentication / research
5. Environmental monitoring
6. Biomedical testing
7. Materials identification
8. Semiconductor research
9. MicroLED measurement
10. Microplastic detection
11. 2D materials

PL / Reflection Image

1. Surface topography inspection
2. MicroLED inspection
3. Single-molecule imaging
4. Biomedical imaging
5. Material surface distribution analysis
6. SiC/GaN inspection

Perovskite Solar Cells

Measurement Targets

Perovskite is a type of calcium titanate mineral with the chemical formula $CaTiO_3$. The term "perovskite" also applies to a class of compounds that share the same crystal structure as $CaTiO_3$ ($XIIA^{2+}VIB^{4+}X_2^{-3}$), known as the perovskite structure. A variety of cations can be incorporated into this structure, enabling the development of numerous engineered materials.

- PL can be used to study band structure, defect and impurity analysis, carrier dynamics, and material quality evaluation.
- Raman measurement can provide insights into structural status, defect and impurity analysis, carrier density, vibration modes, as well as material transitions and phase changes (varying with temperature and pressure).
- TCSPC can reveal carrier dynamics and provide precise measurements of the material's fluorescence lifetime, aiding in the study of photoluminescence properties and the effects of defects and impurities on PL.
- Single-photon detection helps in understanding the quantum properties of perovskites, serving as a key technology for comprehending their quantum states and applications in quantum information processing.

Applications

Perovskite materials can not only convert solar energy into electrical energy, but also convert electrical energy into light. Therefore, they can be used in optoelectronic devices such as light-emitting diodes (LEDs), lasers, and light-emitting transistors (LETs).

Measurement Content	Options
PL Imaging	Option 405
PL Spectrum	Option 405, Option 011, Option 021
Raman Spectrum	Option 532NLD, Option 011
TCSPC	Option 405PC, Option 031, Option 051
Single Photon Detection	Option 405PC, Option 031, Option 051, Option 053

Environmental Toxicology Testing

Measurement Targets

Pesticide residues, heavy metals, malachite green, Sudan red, gutter oil, Melamine, organic compounds, etc.

Each molecule has its unique Raman signal. By comparing the differences in Raman signals, the composition of the substance being tested can be identified, allowing for the detection of harmful substances.

Applications

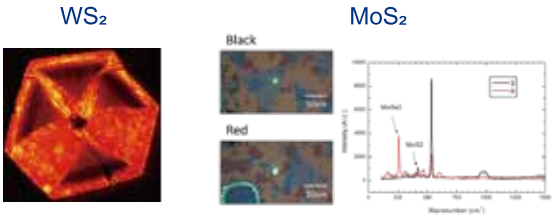
- No sample preparation required. Raman spectroscopy can analyze samples directly, making it highly suitable for environmental monitoring.
- Detection of low-concentration toxins, which is key for identifying trace pollutants in the environment.
- Broad detection capabilities used to detect various environmental toxins, including heavy metals, pesticides, volatile organic compounds (VOCs), and other harmful chemicals.
- Results can be obtained quickly, enabling real-time environmental monitoring.
- Field Applications: the development of portable Raman spectrometers allows on-site environmental toxin detection, facilitating rapid response and mitigation.
- Database support: with the establishment of Raman spectral databases, it becomes easier to identify and quantify various environmental toxins.

Measurement Content	Options
Raman Spectrum	Option 532NLD
Raman Mapping	Option 532NLD, Option 011, Option 021, Option 041
Database Matching	Option 071

2D Materials

Measurement Targets

Molybdenum Disulfide (MoS_2), Tungsten Diselenide (WSe_2), Tungsten Disulfide (WS_2), Hexagonal Boron Nitride (h-BN), and back phosphorus.



- PL can be used to study band structure, defect and impurity analysis, carrier dynamics, and material quality evaluation.
- Raman measurement can provide insights into structural status, defect and impurity analysis, carrier density, vibration modes, as well as material transitions and phase changes (varying with temperature and pressure).
- TCSPC can be used to study carrier dynamics, precisely measure the fluorescence lifetime of materials, and help investigate photoluminescence properties, as well as the effects of defects and impurities on fluorescence. TCSPC can detect extremely weak light signals, which is especially useful for studying high-quality two-dimensional materials or low-concentration samples.
- Single-photon detection aids in understanding the quantum properties of two-dimensional materials, serving as a key technology for exploring their quantum states and applications in quantum information processing. Certain defects or excited states in two-dimensional materials can act as single-photon sources, which have potential applications in quantum communication and quantum computing.

2D Materials

Applications

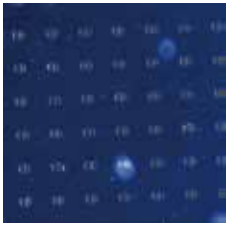
- **Electronic Components:** Transistors, capacitors (memory devices), photovoltaic components, and flexible electronic devices offer high performance and low power consumption, promising significant applications in future electronics.
- **Optical Applications:** These materials exhibit phenomena such as surface plasmon resonance, Raman scattering, and nonlinear optics.
- **Energy Storage:** New 2D materials have been found to have applications in energy storage, including supercapacitors, lithium-ion batteries, and fuel cells, offering benefits such as high energy density and long cycle life.

Measurement Content	Options
PL Imaging	Option 405
PL Spectrum	Option 405, Option 011, Option 021
Raman Spectrum	Option 532NLD, Option 011, Option 021
Raman Mapping	Option 532NLD, Option 011, Option 021, Option 041
TCSPC	Option 405PC, Option 031, Option 051
Single Photon Detection	Option 405PC, Option 061, Option 051, Option 053

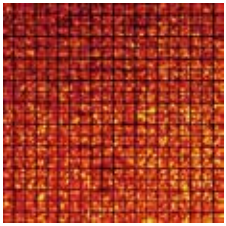
MicroLED Research

Measurement Targets

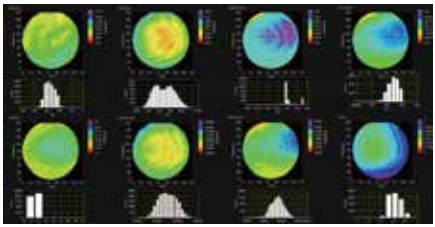
- **Chip:** peak wavelength, peak intensity, full width at half maximum (FWHM), dominant wavelength, CIE XY.
- **Epi:** Bow/Warp, wavelength, intensity, full width at half maximum (FWHM), dominant wavelength, reflectance, film thickness.



White Light Defect Inspection



10 μm Chip PL



Epi Wafer Inspection

Measurement Content	Options
PL Imaging	Option 405
PL Spectrum	Option 405, Option 011, Option 021

Jewelry Authentication

Measurement Targets

Diamond, pearl, jade, emerald, agate, gemstone, etc.
Raman spectroscopy is often referred to as the molecular fingerprint, as different substances have specific signals. By comparing these signals, the material and composition of the substance being tested can be identified.

Applications

Raman spectroscopy is a highly effective technique for identifying jewelry. It is based on the scattering properties of molecules interacting with incident light, providing molecular structure and composition information. Some applications of Raman spectroscopy in jewelry authentication:

1. **Disease Diagnosis:** Raman spectroscopy can be used to detect the molecular composition of biological samples, aiding in the identification of diseases such as cancer.
   Researchers can analyze the spectral differences between tumor and normal tissues to achieve early diagnosis.
2. **Cell Analysis:** Raman spectroscopy allows label-free analysis of intracellular biomolecules, such as proteins and nucleic acids, providing essential information about cell health and function.
3. **Drug Research:** Raman technology can be used to study drug structure, stability, and mechanisms of action within cells, making it highly valuable for drug development and evaluation.
4. **Biomarker Detection:** PL/Raman spectroscopy can identify and quantify biomarkers associated with specific diseases, which is critical for personalized medicine.
5. **Tissue Imaging:** PL confocal imaging technology provides high-resolution structural information of tissues, helping researchers analyze the microstructure of biological tissues.

Measurement Content	Options
PL Imaging	Option 405
PL Spectrum	Option 405, Option 011, Option 021
Raman Spectrum	Option 532NLD, Option 011, Option 021
Database Matching	Option 071

Biomedical Research

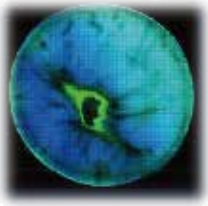


Image of
Pathological Cornea

Measurement Targets

Biological samples, immunostained tissue sections, in vivo studies, cancer screening (e.g. cells, urine, blood).

- Fluorescence in biomedical applications is typically used to label cells or tissues for studying their structure and function, as well as cellular metabolites.
- When cells undergo changes, their molecular structures transform, and Raman signal differences can be used to distinguish between normal and abnormal states.
- PL signals from biological samples, whether normal or abnormal, may have the same intensity or wavelength, making them difficult to differentiate. However, TCSPC can be employed to distinguish the differences between them.

Applications

- **Disease Diagnosis:** Raman spectroscopy can be used to detect the molecular composition of biological samples, aiding in the identification of diseases such as cancer. Researchers can analyze the spectral differences between tumor and normal tissues to achieve early diagnosis.
- **Cell Analysis:** Raman spectroscopy allows label-free analysis of intracellular biomolecules, such as proteins and nucleic acids, providing essential information about cell health and function.
- **Drug Research:** Raman technology can be used to study drug structure, stability, and mechanisms of action within cells, making it highly valuable for drug development and evaluation.

Biomedical Research

Applications

- **Biomarker Detection:** PL/Raman spectroscopy can identify and quantify biomarkers associated with specific diseases, which is critical for personalized medicine.
- **Tissue Imaging:** PL confocal imaging technology provides high-resolution structural information of tissues, helping researchers analyze the microstructure of biological tissues.

Measurement Content	Options
PL Imaging	Option 488
PL Spectrum / Mapping	Option 488, Option 023
Raman Spectrum / Mapping	Option 785NLD, Option 011, Option 021
Multiphoton Microscopy Imaging	Option Ti-SA, Option033
TCSPC	Option 405PC, Option 031, Option 051
FLIM	Option 405PC, Option 031, Option 051, Option 053

Narcotics and Drugs

Measurement Targets

Drug identification, and substance analysis .
Raman spectroscopy is often referred to as the molecular fingerprint, as different substances have specific signals. By comparing these signals, the material and composition of the substance being tested can be identified.

Applications

- **Drug Identification:** Drugs are categorized into tablets, powders, and capsules. Tablets and powders typically lack labeling (only the manufacturer's name may be present), and it is generally impossible to identify drugs solely by their color or shape. Raman spectroscopy can be used for drug analysis and identification.
- **Narcotics Identification:** Chemical methods for drug identification require a certain amount of time. Identifying substances by smell or taste risks compromising objectivity. Raman spectroscopy provides precise and rapid identification without damaging the evidence.

Measurement Content	Options
Raman Spectrum	Option 785NLD, Option 011, Option 021
Raman Mapping	Option 785NLD, Option 011, Option 021, Option 041
Database Matching	Option 071

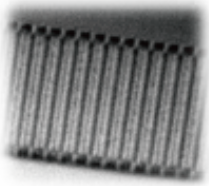
Surface Topography Measurement

Measurement Targets

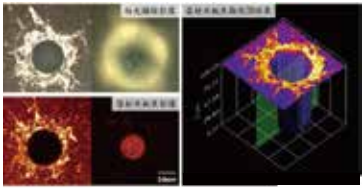
Surface topography, surface roughness, high aspect ratio hole measurement, transparent material inspection, 3D imaging.

Applications

PCB substrate laser via inspection, PCB back drilling measurement.



Microcircuit pitch 0.8μm



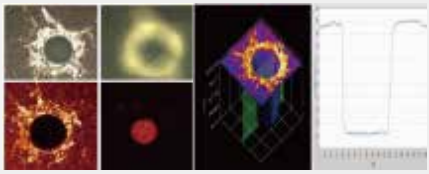
Laser Via, blind hole

Measurement Content	Options
Reflective Measurement	Option 405

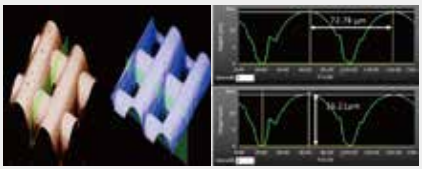
Applications of Other Reflection Modes

(Based on Sample Topography Rather Than Molecular Properties)

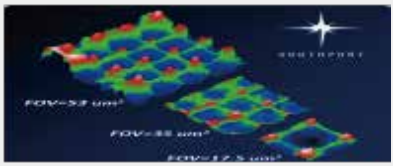
PCB Via Imaging



Light Guide Topology

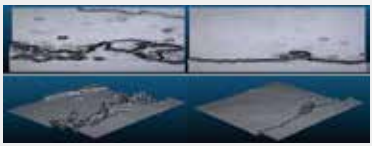


Micro Lens Topology



Transparent TF Circuit

Micro Profiling on Silicon



Membrane Inspection

03

Options and Specification

- Options
- Specification

Order Configuration (1)

Main System: SP8000A Laser Scanning Confocal Measurement Development Platform

White Light Microscope OM x1, Hamamatsu 185nm - 750nm PMT x1,
5mm x 7mm Galvo set x1, Filter Wheel x1, 5x Objective Lens x1, 10x Objective Lens x1,
20x Objective Lens x1, 50x Objective Lens x1, Manual XY Stage with 100mm x 100mm
Travel Range, Motorized Z-Axis, Operating Software

Option: Laser

Option 405	Cobolt Series 6 405nm CW Diode Laser 150mW x1, 405 LP Edge Filter x1
Option 405NLD	Cobolt Series 8 405nm CW DPSS Laser 40mW x1, 405 LP Edge Filter x1
Option 488	Cobolt Series 6 488nm CW Diode Laser 150mW Diode Laser x1, 488 LP Edge Filter x1
Option 532NLD	Cobolt Series 8 532nm CW DPSS Laser 200mW x1, 532 LP Edge Filter x1
Option 638NLD	Cobolt Series 8 638nm CW DPSS Laser 80mW x1, 638 LP Edge Filter x1
Option 785NLD	Cobolt Series 8 785nm CW DPSS Laser 500mW x1, 785 LP Edge Filter x1
Option 405PC	PicoQuant LDH P-C-405nm 80ps Pulse Laser 50mW with 80MHz Repetition Rate x1, 405 LP Edge Filter x1
Option 488P	PicoQuant LDH P-C-488nm 140ps Pulse Laser 140mW with 40MHz Repetition Rate x1, 488 LP Edge Filter x1
Option Ti-Sa	Coherent Chameleon Vision II With Adjustable GDD, Tuning Range 690-1020, Output Power 3.0W

Order Configuration (2)

Option: Spectrometer

Option 011	Andor Kymera 328i Monochromator with 328mm Focal Length, 150 l/mm-blaze 500 Grating x1, 1200 l/mm-blaze Grating x1
Option 012	Andor Kymera 193 Monochromator with 193mm Focal Length, 150 l/mm-blaze 500 Grating x1, 1200 l/mm-blaze Grating x1
Option 013	Andor Shamrock 500 Monochromator with 500mm Focal Length, 150 l/mm-blaze 500 Grating x1, 1200 l/mm-blaze Grating x1
Option 021	Andor iVac 316 Camera, 2000x256 pixels, QE 70% at 550nm, TE Cooling Down to -60°C
Option 022	Andor iDus 420 BEX2-DD Camera, 1024x256 pixels, OE > 88% Between 400-800nm, TE Cooling Down to -80°C
Option 023	Ocean Optics SR4, Wavelength Range 220-1050nm x1

Option: PMT

Option 031	PMT Module (SP) x1
Option 032	PMT Hamamatsu H16722-40 x1, Non-descan Module x1, Control Box x1
Option 033	PMT Hamamatsu H16722-40 x2, Non-descan Module x1, Dichroic Filter Set x1, Control Box x1

Order Configuration (3)

Option: Motorized Stage

Option 041	Motorized XY Stage with Travel Range 205mm x 205mm

Option: Lifetime

Option 051	Hardware PicoQuant HydraHarp 400, up to 8 Input and Sync Channel, Interface USB 3.0 x1
Option 052	Hardware PicoQuant PicoHarp 260, 2 Detect Channel, Interface PCIe 2.0 x1
Option 053	Software PicoQuant SynPhoTime64 2 x1

Option: Single Photon Detection

Option 061	50/50 Beamsplitter, APD x2

Option: Database

Option 071	S.T. Japan

Specification

Item	Content	
Measurement Method	Laser scanning confocal microscope	
Laser Wavelength	Up to 4 LASERs (Laser source option: 405nm, 532nm, 633nm, 785nm)	
Input/Output Port	One Laser input port (free space) Output: Signal through fiber (FC/PC; SMA)	
Objective	5X FOV 2mm x 2mm, 10X FOV 1mm x 1mm, 20X FOV 500μm x 500μm, 50X FOV 200μm x 200μm	
Built-in OM (Optical Microscope) System	Epi-illumination: Adjustable white light LED (IR option) 3MP, 1” Color CMOS Camera	
Motor-Z Focusing System	Travel range: 30mm Resolution (typical): 0.02μm Repeatability: 0.1μm Motor: 2 phase stepper motor High precision joystick	
XY Stage	Manual stage	Travel range: 100mm x 100mm Resolution: 1μm
	Motorized stage (Optional)	Travel range: 205mm x 205mm (8") Resolution: 1nm Repeatability: 0.025μm Velocity: 90mm/s 2-phase stepper motor
Detector	Biakali PMT, Spectral response: 185nm - 750nm	
Data Station	OS: Windows 11 Interface USB 3.0 Discrete display card HDD > 1T 24” LCD display	
Weight	80 KG	
Dimension	Closed: L 755mm x W 560mm x H 629mm Open: L 901mm x W 560mm x H 957mm	
Electrical Character	110/220V 50/60Hz AC, 150W	

Contact us

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