



Your Photonics Partner

Raman Solution

Voyage™ Confocal Raman Microscope

True Confocality and True Flexibility



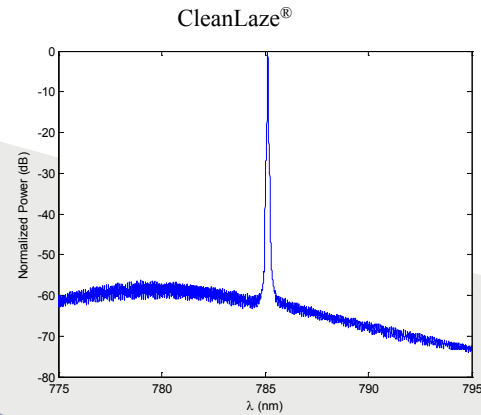
Features:

- Optimized True Confocal Design
- Spectral Resolution 3cm^{-1} *
- 100 cm^{-1} of the Rayleigh Line
- Patented CleanLaze® Technology for Laser Stabilization
- Two-Stage TE Cooling Detector to -20°C
- Adjustable Slit

* Typical Resolution Measured Using Pen Lamp Emission

The Voyage™ is a Confocal Raman Microscope System that is designed to deliver true confocality and true flexibility. Its robust opto-mechanical design provides one design to fit an Olympus BX51 or BX51M research microscope. Its optimized optical design for confocal concept, combined with B&W Tek, Inc.'s patented CleanLaze® laser and patent pending high resolution spectrometer, delivers a high spectral resolution of 3cm⁻¹*

Laser



Creating Raman Scatter

In Raman spectroscopy it is essential to utilize a clean, narrow bandwidth laser due to the fact that the quality of the Raman peaks are directly affected by the sharpness and stability of the delivered light source. The Voyage™ spectrometer system features a patented CleanLaze® technology with a typical linewidth < 0.03nm when equipped with our Single Mode 785nm laser. This technology results in the correct center wavelength and avoids the phenomenon of “mode hopping.” A typical linewidth of < 0.03nm is achieved with our Single Mode 532nm laser. The output power of these lasers can be adjusted in the software to 0%, 10%, & 100% with a manual laser power adjustment via neutral density filters at 100%, 79%, 50%, 25%, and 10%. Power adjustment helps prevent laser exposure damage to the sample. With a standard automatic shutter photo bleaching on a variety of sample types is prevented.

Laser lifetime of 10,000 hours ensures quality data for years to come!

Filter

Collects Data within 100cm⁻¹ of the Rayleigh Line

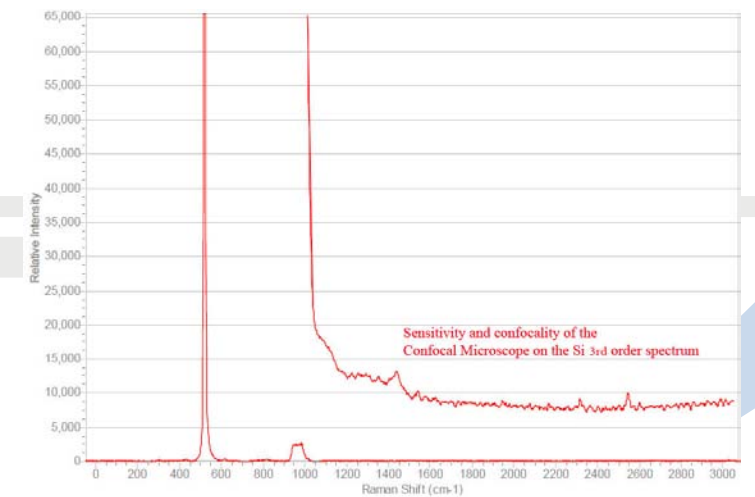
The center wavelength of the laser line is precisely maintained even when the peak power is increased by utilizing a series of high end filters. A laser line filter is used to clean up any side bands and ensure a narrow excitation is delivered to the sample by removing all secondary excitation lines before exciting the sample. The light collected from the sample is then filtered via a notch filter. Finally, an ultra steep long pass filter further removes lingering laser line to allow accurate measurement of Raman peaks as close as 100cm⁻¹ from the Rayleigh line.



Sharp Resolution

Smart Optical Design

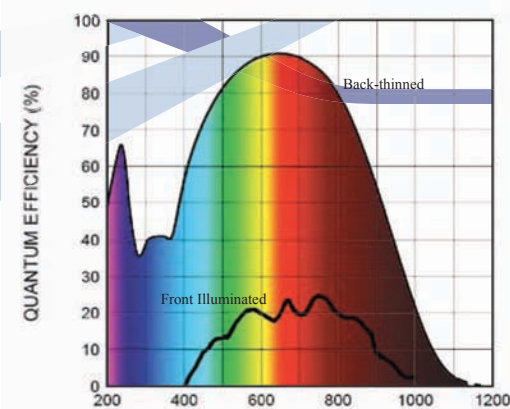
B&W Tek, Inc.'s proprietary design of double path transmission optics is a key element in achieving research level spectral resolution of 3cm⁻¹. The innovative optics makes the combination of high throughput and high resolution possible.



High Sensitivity Detector

Digitization of Photons

The Voyage™ features a Back-thinned two dimensional charge coupled device (CCD) to detect the dispersed Raman signal. The Back-thinned CCD with 90% QE can collect incoming photons at wavelengths that would not pass through a front illuminated CCD. The detector is TE Cooled to -20°C to maximize dynamic range by reducing dark current. 2D binning operation mode enables maximization of the signal-to-noise ratio.



True Confocality

Optimized Confocal Concept

To achieve the highest degree of confocality, B&W Tek, Inc.'s confocal design features two optically conjugated pinholes, one of which is placed in the laser path and the other at the entrance of the spectrometer. Therefore, the sample volume from which the light is collected and the amount of out-of-focus light blocked is precisely defined. Such design offers the best performance without sacrificing efficiency or ease of use.



* Typical Resolution Measured Using Pen Lamp Emission

Applications & Experience



Bioscience and Medical Diagnosis:

- Subtle changes within biomolecules, such as drug interactions, tissue healing, cosmetics, disease diagnosis
- Intercellular SERS localization and interaction. Identification of drug binding to cells for Drug-DNA and cellular interaction analysis
- Investigation of microorganisms in single cells; yeast cell classifications, single bacterium
- Oxygenation measurements of blood and tissue
- Molecular level cancer detection (cervical, lung, etc.)
- Cardiovascular disease diagnosis (atherosclerosis)



Pharmaceutical Industry:

- Analysis of tablets, liquids, and gel caps
- High throughput screening techniques
- Crystallization, end point detection
- Process Analytical Technology (PAT) on-line, at-line monitoring and control: real-time monitoring of drying, coating, and blending
- Identification and analysis of API, additives, and excipients
- Drug identification control device: Purity and Quality
- Raw material inspection: 100% incoming material identification & verification



Raman Microscopy:

- Pharmaceutical drug analysis: micro-Raman and localized molecular species analysis in complex drug mixtures, such as beta-carotene in multivitamins
- Material science thin film analysis, such as diamond film quality characterization
- Trace forensic evidence analysis, including fibers, fabrics, pigments, inks, etc.



Polymers and Chemical Processes:

- Quality Control: Incoming/Outgoing
- Identification of contaminants during manufacturing
- Real time monitoring of polymerization
- Predicting the morphological properties of polymers
- Multivariate Analysis/Chemometrics to predict physical properties: glass transition temperature, crystallization temperature, etc.
- Chemical composition analysis



Environmental Science:

- Water pollution detection using SERS technology
- Identification of contaminants in water
- Petrochemical analysis
- Identification and analysis of sediments in water

Applications & Experience

Forensic Analysis:

- Nondestructive drug and narcotic drug identification
- Explosives: exact chemical compositions of materials, PETN, RDX and binding agents within explosive materials
- Identification and analysis of toxic solvents and bio-warfare agents
- Trace forensic evidence analysis, including fibers, fabrics, pigments, inks, etc., by Raman microscopy



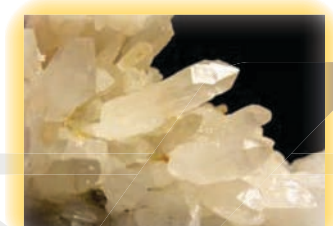
Gemology:

- Non-invasive gemstone identification and examination
- Identify unknown gemstone by unique Raman signal
- Identification of isomorph or subspecies of gemstone
- Analysis of gemstone origin through Raman microscopy
- Anti-counterfeiting, such as identification of diamond from zircon



Geology and Mineralogy:

- Identification of geological materials
- Examination of inclusions in minerals
- Analysis of cement clinker by Raman microscopy
- Ancient fossil analysis



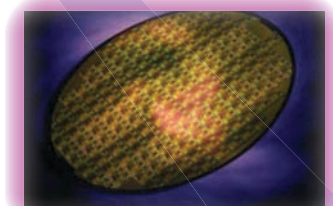
Food & Agriculture Industry:

- Measuring the unsaturated fatty acid in food oils
- Detecting bacteria and/or contaminants in food products
- Identification of additive drugs: nutraceuticals in fruit drinks
- Analysis of components in grain kernel



Semiconductor & Solar Industry:

- Characterization of silicon crystallinity: Monitoring of the Raman band shift as silicon crystallinity changes from amorphous to a polycrystalline structure
- Analysis of micron sized particles in situ to provide information on potential contamination
- Mechanical stress monitoring for semiconductor process



Voyage™ Specifications

Microscope	
Compatible Microscope	Olympus BX51, Olympus BX51M
Z Adjustment Resolution	1µm
X/Y Resolution	Depending on stage and objectives
Depth of Focus	0.5µm to 180µm up to objective
Camera	PGR Chameleon™ USB 2.0 Digital Camera
Objectives Included	VOL-202 (20x), VOL-205 (50x)
Lasers	
532nm excitation	785nm excitation
Single mode	√
Linewidth	< 0.03nm
Coupling	NA
Wavelength	532 ± 0.5nm
Power at Sample	20 – 22mW
Laser Power Control	Software Control: 0%, 10%, & 100% Manual Control: 100%, 79%, 50%, 25%, & 10% (via ND Filters)
Spectrometer	
Range	Resolution*
Voyage-532S	100cm ⁻¹ - 3750cm ⁻¹
Voyage-532H	100cm ⁻¹ - 3000cm ⁻¹
Voyage-785S	100cm ⁻¹ - 3000cm ⁻¹
Voyage-785H	100cm ⁻¹ - 2500cm ⁻¹
Signal-to-Noise Ratio	Silicon 3rd order Raman peak SNR > 3:1
Detector	
Detector type	TE Cooled, Back-thinned, 2D-binning CCD
TE Cooling temperature	~ -20°C
Max Quantum Efficiency	90%
Number of pixels (2D)	2048 (H) x 122 (V)
Pixel Size	12 x 12µm
Adjustable Slit	Effective Height: 1mm, Effective Width: 0 - 200µm, Increments: 10µm
Digitization resolution	16-bit or 65,535:1
Digitizer speed	250 kHz
Integration time	12ms – 120 min
Software	
Software	BWSpec™
Operation Mode	Linear Mode & 2D Mode
Binning Option (2D mode)	Odd Row Binning
Data Format	TXT, SPC, and EXCEL
System Operation	
Computer Interface	USB 2.0 / 1.1
Power Input	100-240 V AC, 50 - 60 Hz
Ambient Temperature	20 – 28°C
Humidity	< 75% RH
Dimension	318 x 412 x 415 mm
Weight	27 kg

*Typical Resolution Measured Using Pen Lamp Emission

Confocal Product Family

Model	Excitation Wavelength	Laser Power (mW)	Spectral Range (cm ⁻¹)	Spectral Resolution (cm ⁻¹)*
BWS435-532S-Y	532nm, single mode	20-22	100 - 3750	4.0 @ 609nm
BWS435-532H-Y	532nm, single mode	20-22	100 - 3000	3.0 @ 609nm
BWS435-785S-Y	CleanLaze® 785nm, single mode	> 15	100 - 3000	3.5 @ 912nm
BWS435-785H-Y	CleanLaze® 785nm, single mode	> 15	100 - 2500	3.0 @ 912nm

* Typical Resolution Measured Using Pen Lamp Emission

Microscope Objective Lens

Model	Magnification	N. A.	Working Distance (mm)
VOL-101	10x	0.30	11.0
VOL-102	20x	0.45	3.1
VOL-105	50x	0.80	1.0
VOL-110	100x	0.90	1.0
VOL-202	20x	0.40	12.0
VOL-205	50x	0.50	10.6
VOL-210	100x	0.80	3.4

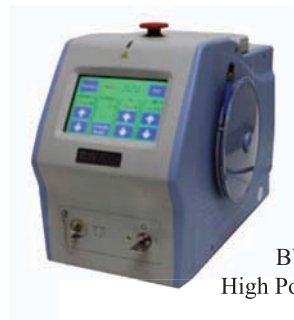
Accessories

Model	Description
CAM-USB	RGB USB 2.0 camera, video port C-mount adaptor and software included
BAC063-532	Laser Safety Goggles for 532nm laser for B&W Tek, Inc.'s class IIIb laser systems only
BAC063-785	Laser Safety Goggles for 785nm laser for B&W Tek, Inc.'s class IIIb laser systems only



Additional Laser Products

- **High Power Lasers**
Up to 200 W with wavelengths from 635nm - 2000nm
- **Solid-State Lasers**
TEM₀₀ beam quality from 4mW - 2500mW
- **Fiber Coupled Lasers**
Multi-mode or single-mode fiber coupled lasers up to 20W with wavelengths from 635nm - 2000nm
- **Multi-channel Lasers**
Custom configurations 960nm -1650nm



BWF5
High Power Laser



CleanLaze®
Turnkey End User Package

Additional Spectroscopy Products

- **UV-Vis-NIR Spectrometer Modules**
Compact, USB interface, plug-and-play
- **i-Spec Spectrophotometers**
Models from 190nm - 2500nm
- **Raman Spectrometer Systems**
Portable systems: 785nm, 532nm, and custom
- **Raman Microscopy and Micro Sampling**
Confocal Raman microscopes & video micro sampling accessories
- **Sampling Accessories**
Cuvette holders, optical fibers, fiber probes, etc.



i-Raman™
Portable Raman System



i-trometer™
Back-thinned CCD
Array Spectrometer

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