B&W TEK INC.

Your Photonics Partner

Raman Solution

Voyage™ Confocal Raman Microscope

True Confocality and True Flexibility

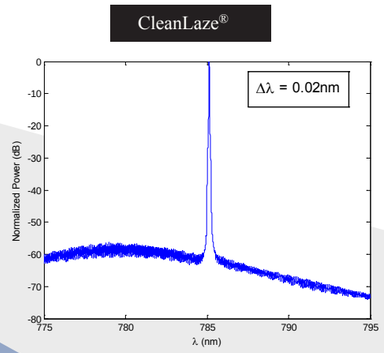
Features:

- Optimized True Confocal Design
- Spectral Resolution 3 cm^{-1}
- 100 cm^{-1} of the Rayleigh Line
- Two-Stage TE-cooling Detector to -20ºC
- One Design Fits Multiple Microscopes
- Retrofit for Users with Microscopes
- Adjustable Slit

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 multiple microscopes, including Olympus BX51 research microscope or Nikon Eclipse 80i advanced research microscope. In addition, the innovative design of detachable confocal sub-assembly provides the retrofit for users to turn their own microscopes into confocal Raman microscope. Its optimized optical design for confocal concept, combined with B&W Tek's patented CleanLaze® laser and patent pending high resolution spectrometer, delivers the smallest spot size in the market and a high spectral resolution of 3 cm^{-1}.

Laser

Creating Raman Scatter



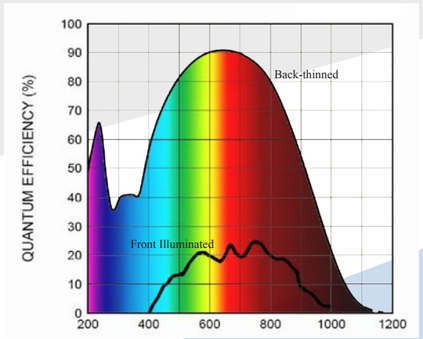
In Raman spectroscopy it is essential to utilize a clean, narrow bandwidth laser due to the fact that the quality of the Raman peaks are directly affected by the sharpness and stability of the delivered light source. The Voyage™ spectrometer system features a patented CleanLaze® technology with linewidth as narrow as 0.02 nm when equipped with our 785 nm laser. This technology results in the correct center wavelength and avoids the phenomenon of "mode hopping." In addition, the laser output power can be adjusted in the software from 0 - 100%, preventing damage to the sample from laser exposure. Our standard automatic shutter will reduce photobleaching for a variety of different sample types.

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

True Confocality

Optimized Confocal Concept

To achieve the highest degree of confocality, B&W Tek's confocal design features two optically conjugated pinholes, one of which is placed in the laser path and the other is placed 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 real and the best confocal performance without any sacrificing efficiency or ease of use.



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 CCD is used to obtain 90% QE via collection of 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 SNR. As a result the 4th order Raman peak of Si can be detected in less than one minute.

True Flexibility

Retrofit Compatible with Multiple Microscopes

B&W Tek's confocal design is compatible with the two most widely used microscopes: Olympus BX51 and Nikon 80i. For users who already have microscopes, the retrofit (an innovative, detachable confocal sub-assembly) is an extremely cost-effective solution for them to turn their microscopes into confocal Raman microscopes. The retrofit is very simple to install with no alignment work needed.

Filter

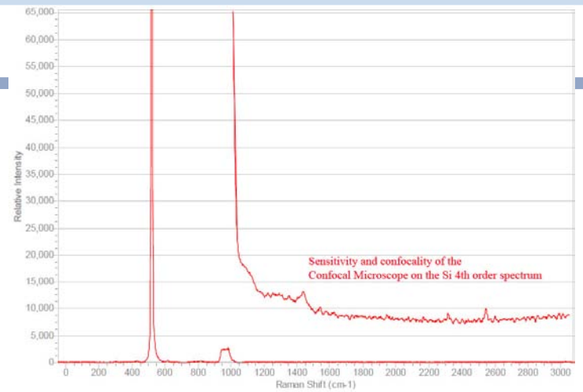
Collects Data within 100cm^{-1} of the Rayleigh Line

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 bans 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's proprietary design of double path transmission optics is a key element in achieving research level spectral resolution of 3 cm^{-1}. The innovative optics makes the combination of high throughput and high resolution possible.



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:

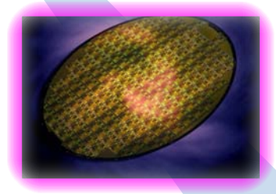
- Identification of geological materials
- Examination of inclusions in minerals
- Analysis of cement clinker by Raman microscopy
- Ancient fossil analysis

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	Nikon Eclipse 80i
Z Adjustment Resolution	1 µm	
X/Y Resolution	Depending on stage and objectives	
Depth of Focus	0.5 µm to 180 µm up to objective	
Camera	PGR Chameleon™ USB 2.0 Digital Camera	
Lasers		
Excitation	532 nm excitation	785 nm excitation
Single mode	√	√
Multimode	NA	√
Linewidth	<1 cm^{-1}	±0.02 nm (single), ±0.2 nm (multimode)
Coupling	NA	9 µm Fiber Single Mode 50 µm Fiber Multimode
Wavelength	532 ± 0.5 nm	785 ± 0.5 nm
Power at Sample	20 – 22 mW	>15 mW (single mode) > 150 mW (mulitimode)
Adjustable Power	Neutral density filters at 100%, 79%, 50%, 25%, 10%, 5%, 1% and 0%	I2C controlled 0-100% adjustable
Spectrometer		
Spectral Range	100-3050 cm^{-1}	100-2550 cm^{-1} (100-3100 cm^{-1} optional)
Spectral Resolution	3.8 cm^{-1}	3 cm^{-1} (4.5 cm^{-1} optional)
Signal-to-Noise Ratio	Silicon 3rd order Raman peak SNR > 6:1	
Detector		
Detector type	TE-cooled, Back-thinned, 2D-binning CCD	
Detector	Hamamatsu S10141-1107S, TE-cooled	
TE cooling temperature	-20°C	
Max Quantum Efficiency	90%	
Number of pixels (2D)	2048 (H) x 122 (V)	
Pixel Size	12 x 12 µm	
Pixel Resolution	1.75 cm^{-1}	
Adjustable Slit	0 – 2 mm Adjustable	
Digitization resolution	16-bit or 65535 — 1	
Digitizer speed	250 KHz	
Integration time	12 ms — 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	110-240 VAC, 50 - 60 Hz	
Environment Temperature	20 — 28°C	
Humidity	< 75% RH	

Form Factors			
Model	Olympus BX51	Nikon Eclipse 80i	Retrofit
Dimension	318 x 412 x 415 mm	300 x 561 x 514 mm	345 x 128 x 355 mm
Weight	27 Kg	27 Kg	9 Kg

Confocal Product Family

Model	Microscope	Excitation Wavelength (nm)	Laser Power (mW)	Spectral Range (cm^{-1})	Spectral Resolution (cm^{-1})
BWS435-532SY	Olympus BX51	532 nm, single mode	20-22 mW	100 - 3050	3.8
BWS435-532SN	Olympus BX51	532 nm, single mode	20-22 mW	100 - 3050	3.8
BWS435-532SR	User Microscope	532 nm, single mode	20-22 mW	100 - 3050	3.8
BWS435-785MY	Olympus BX51	Cleanlaze® 785 nm, multimode	> 150 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)
BWS435-785MN	Nikon Eclips 80i	Cleanlaze® 785 nm, multimode	> 150 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)
BWS435-785MR	User Microscope	Cleanlaze® 785 nm, multimode	> 150 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)
BWS435-785SY	Olympus BX51	Cleanlaze® 785 nm, single mode	> 15 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)
BWS435-785SN	Nikon Eclips 80i	Cleanlaze® 785 nm, single mode	> 15 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)
BWS435-785SR	User Microscope	Cleanlaze® 785 nm, single mode	> 15 mW	100-2500 100-3100 (OP)	3.0 4.5 (OP)

Microscope Objective Lens

Model	Microscope	Magnification	N. A.	Working Distance (mm)
VOL-101	Olympus BX51	10x	0.30	11.0
VOL-102	Olympus BX51	20x	0.45	3.1
VOL-105	Olympus BX51	50x	0.80	1.0
VOL-110	Olympus BX51	100x	0.90	1.0
VOL-202	Olympus BX51	20x	0.40	12.0
VOL-205	Olympus BX51	50x	0.50	10.6
VOL-210	Olympus BX51	100x	0.80	3.4
VNL-302	Nikon 80i	20X	0.40	13.0
VNL-305	Nikon 80i	50X	0.55	10.1
VNL-310	Nikon 80i	100X	0.80	3.5

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To find out more:

Contact our Application Team for your unique solution

Let us run your sample! - Feasibility Studies Available

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