

Raman Solution

## i-Raman™

### Sensitive, Versatile, Simple



The i-Raman® is unique for its high resolution combined with field-portability, with performance comparable to large bench-top Raman systems and weighing less than 7 lbs. The system's small footprint, lightweight design, and low power consumption provides research grade Raman capabilities anywhere!

### Features:

- Spectral Resolution of 3cm<sup>-1</sup>
- 175cm<sup>-1</sup> of the Rayleigh Line  
65cm<sup>-1</sup> Option Available
- Wide Raman Shift Coverage
- Patented CleanLaze® Technology for Laser Stabilization
- TE Cooled 2048 Pixel Array
- Fiber Optic Interface for Convenient Sampling

### Specifications:

<b>Laser</b>		
532nm Excitation	< 50mW	
785nm Excitation	< 300mW	
830nm Excitation	< 300mW	
Laser Power Control	532nm†, 785nm, 830nm	
<b>Spectrometer</b>	<b>Range</b>	<b>Resolution*</b>
i-Raman-532S	175cm <sup>-1</sup> - 4000cm <sup>-1</sup>	~ 4.0cm <sup>-1</sup> @ 614nm
i-Raman-532H	175cm <sup>-1</sup> - 3300cm <sup>-1</sup>	~ 3.0cm <sup>-1</sup> @ 614nm
i-Raman-785S	175cm <sup>-1</sup> - 3200cm <sup>-1</sup>	~ 4.5cm <sup>-1</sup> @ 912nm
i-Raman-785H	175cm <sup>-1</sup> - 2700cm <sup>-1</sup>	~ 3.5cm <sup>-1</sup> @ 912nm
i-Raman-830	200cm <sup>-1</sup> - 2300cm <sup>-1</sup>	~ 4.0cm <sup>-1</sup> @ 912nm
<b>Detector</b>		
Detector Type	TE Cooled Linear Array	
Pixel Number	2048	
Pixel Size	14µm x 200µm	
TE Cooling Temperature	10°C	
Dynamic Range	1300:1 (typical)	
Digitization Resolution	16-bit or 65,535:1	
Readout Speed	500 kHz	
Integration Time	5ms - 65,535ms	
<b>Electronics</b>		
Computer Interface	USB 2.0 / 1.1	
Trigger	Yes (Compatible with BWTek Probes)	
<b>Power Options</b>		
DC (Standard)	5V DC @ 8 Amps	
AC (Optional)	100 - 240V AC, 50 - 60Hz	
Battery	Optional w/ DC only	
<b>Physical</b>		
Dimensions	17 x 34 x 23.4cm (6.7 x 13.4 x 9.2in)	
Weight	~3 kg (~6.6 lbs)	
Operating Temperature	10°C - 35°C	
Storage Temperature	-10°C - 60°C	
Humidity	10% - 85%	

### Why Choose Raman?

- No sample preparation required
- Measure through glass, quartz, plastic (non-contact)
- Samples can be solid, liquid or gas, transparent or opaque
- Small sample size to reduce cost
- Wide spectral coverage for diversity of applications
- Spectra that is more clean and precise than FTIR or NIR

### Accessories:

Raman Probes  
Cuvette Holders  
Probe Holders  
Video Microscope  
Microscope Adaptor  
Raman Flow Cells  
Laser Safety Goggles

### Applications:

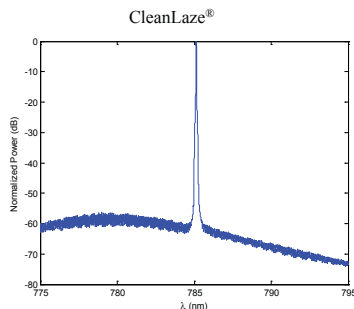
**Bioscience and Medical Diagnosis**  
**Pharmaceutical Industry**  
**Raman Microscopy**  
**Polymers and Chemical Processes**  
**Environmental Science**  
**Forensic Analysis**  
**Gemology**  
**Geology and Mineralogy**  
**Food & Agriculture Industry**  
**Semiconductor & Solar Industry**

Excitation Wavelength

## 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 i-Raman® spectrometer system features a patented CleanLaze® technology with a linewidth < 0.3nm when equipped with our 785nm and 830nm 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%, allowing you to maximize the signal-to-noise ratio and minimize integration time.



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

Near-Excitation Raman

## Filter

### Collects Data within 175cm<sup>-1</sup> 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 175cm<sup>-1</sup> from the Rayleigh line. An E-grade Filter upgrade is available allowing the measurement of Raman peaks as close as 65cm<sup>-1</sup> from the Rayleigh line.

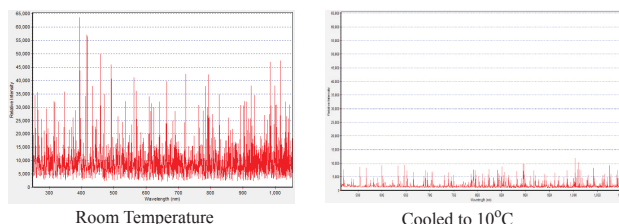
Low-Light Level

## Detector

### Cooled Detector for Low-Light Level Detection

Cooling an array detector with a built-in thermoelectric cooler (TEC) is an effective way to reduce dark current and noise to enhance the dynamic range and detection limit. The graphs below show the dark current and noise for an uncooled versus a cooled CCD detector at an integration time of 30 seconds. Operating at room temperature, the dark current nearly saturates the uncooled CCD. When the CCD is cooled to 10°C, the dark current is reduced by four times. This allows the spectrometer to operate at long integration times and detect weak optical signals.

Dark Current: Uncooled vs. Cooled CCD Detectors at 30 Seconds

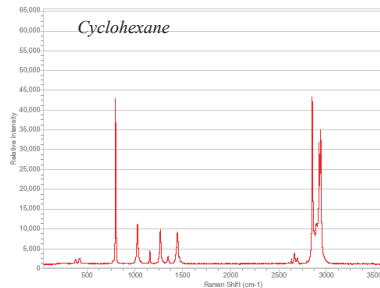


Sharp Resolution

## Spectrometer

### Optimized for Raman Spectroscopy

The spectrometer design is dedicated for Raman applications. You can customize your spectrometer by choosing from a variety of excitation wavelengths. In addition, each configuration can be further customized for your individual detection needs. Choose from wider spectral range or high resolution optimized systems. Research grade spectral resolution of 3cm<sup>-1</sup> can be achieved with our double pass transmission optics. Most Raman applications do not require such tight resolution, for those more general applications, a system that provides a wider spectral range is your solution. The high-throughput optical layout of all i-Raman® configurations are ideal for those low-light level Raman applications.



Easy Sampling

## Probe

### Easy Transition Between Sample Types

The probe allows for measurement of various materials in the form of liquids, gels, powders, or solids under both lab conditions (Lab Grade) or demanding environmental conditions (Industrial Grade). Constructed with state-of-the-art telecom packaging techniques, the probe has a flexible fiber coupling encased in a durable protective jacketing material which delivers Rayleigh scatter rejection as high as 10 photons per billion. Wavelength excitation probes come in 532nm, 785nm, or 830nm.

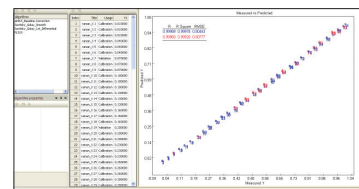
Custom wavelength excitation probes available.

Convenient

## Software

### State of the Art Chemometric Software

B&W Tek offers comprehensive software packages that provide solutions all application needs. Powerful calculations, easy data management, and user friendly easy-to-follow work flow!



BWSpec™ is the foundation for all B&W Tek software platforms and come standard with every spectrometer. Built on the proven BWSpec™ platform, BWID™ is optimized for identification and verification of materials. For industrial Raman applications that require federal compliance: BWID™-Pharma supports all requirements for FDA 21 CFR Part 11 Compliance.

The most recent addition to B&W Tek's software portfolio, BWIQ™ chemometrics software for use with the i-Raman® and other high resolution Raman products. BWIQ™ is a multivariate analysis software package which can analyze spectral data and discover internal relationships between spectra and response data or spectra and sample classes. By coupling new and transitional chemometric methods with cutting edge computer science technology such as sparse linear algebra algorithms, BWIQ™ represents the next generation in speed, accuracy, and performance.