

# THz-Raman SPECTROSCOPY SYSTEM

## Advanced Materials Characterization

Our THz-Raman™ Spectroscopy Systems expands the capabilities of traditional Raman spectroscopy into the Terahertz/low-frequency domain, capturing the same range of energy transitions as terahertz spectroscopy while retaining the ability to measure the Raman “Chemical Fingerprint” region. With patented<sup>1</sup> ultra-narrowband notch and ASE clean-up filters, built-in thermal compensation, and a variety of sample accessories, these systems offer robust and stable performance for virtually any application. No special sample preparation is needed, enabling real-time, in situ analysis of material processes. This eliminates the need for multiple instruments or offline sampling, reducing capital equipment, training, and maintenance costs.

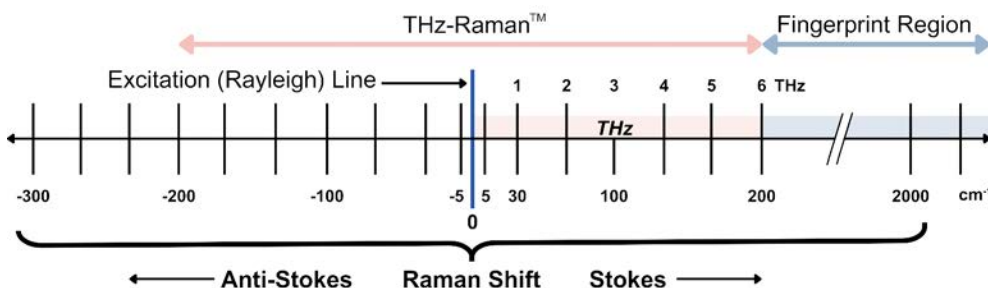


## FEATURES

- Robust, sealed, patented optical design with broad range of operating temperature
- Multiple interchangeable sample accessories
- Simultaneous Stokes and anti-Stokes signals improve SNR while providing an inherent calibration reference
- Excitation wavelengths – 532, 785 or 830 nm
- Dual-polarization variant provides for simultaneous measurement Raman scatter in both polarizations
- Dual-laser variant (830 + 638 nm) extends measurement range upto 3500  $\text{cm}^{-1}$ , with high quantum efficiency
- Fiber coupled output enables optional interfacing with a wide range of spectrometers

## APPLICATIONS

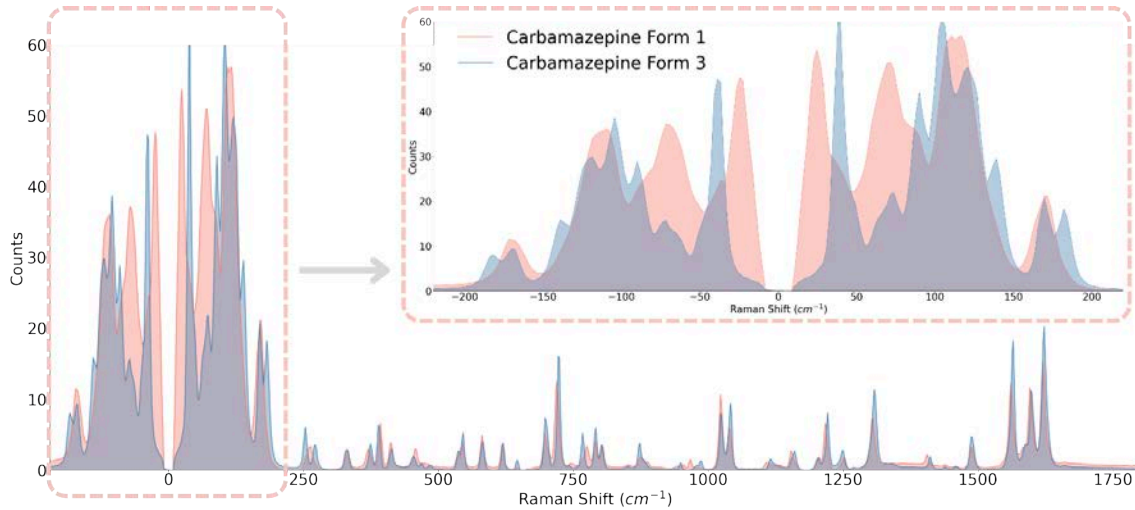
- Process monitoring of phase transformations and solid-state chemistry
- Polymorphism - differentiation and salt screening of polymorphs (see Figure 1 on page 2)
- Crystallinity meter - Monitoring and quantifying degree of crystallinity
- Characterizing and observing co-crystal formation
- Nanomaterials - characterizing thickness and orientation of Two-dimensional nanomaterials like TMDs
- Structural characterization of polymers



<sup>1</sup> US Patents 7,986,407 and 8,184,285.

Example Application: Polymorphism in Pharmaceutical R&D

Figure 1. THz-Raman Spectra of Carbamazepine polymorphs with TR-PROBE (785 nm, acquisition time = 500 ms)



Sampling Options



## Sample Interface Accessory Details

### Vial Adapter



The vial adapter simplifies sample insertion and includes various vial inserts, a tablet clamp, micrometer for fine focus, and an automatic safety shutter.

### Bottom-Up Vial Adapter



The bottom-up vial adapter is useful for vials with opaque, labelled sidewalls or low sample volume. It includes a micrometer for fine focus and an automatic safety shutter.

### Free Space Adapter



This free space adapter is a steerable non-contact adapter, which rotates 360° for stand-off applications, supports various lenses, features fine focus adjustments, and includes a manual safety shutter.

### Microscope Adapter



The microscope adapter connects with most popular brands of microscopes, providing visual images while measuring Raman spectra. The added side port (shown above) provides optional interfacing with our vial adapters.

### FloodLight Large Area Illumination Adapter



The FloodLight adapter averages samples over a larger area for best THz-Raman signal capture, switchable to static for spatial variations.

### Transmission Raman Adapter



The microscope adapter connects with most popular brands of microscopes, providing visual images while measuring Raman spectra. The added side port (shown above) provides optional interfacing with our vial adapters.

### Contact / Immersion Probe Tip



The probe tip uses a UV sapphire ball lens for easy sample analysis, available in various lengths and diameters, and connects via SwageLok mount.

### Non-Contact Probe Tip



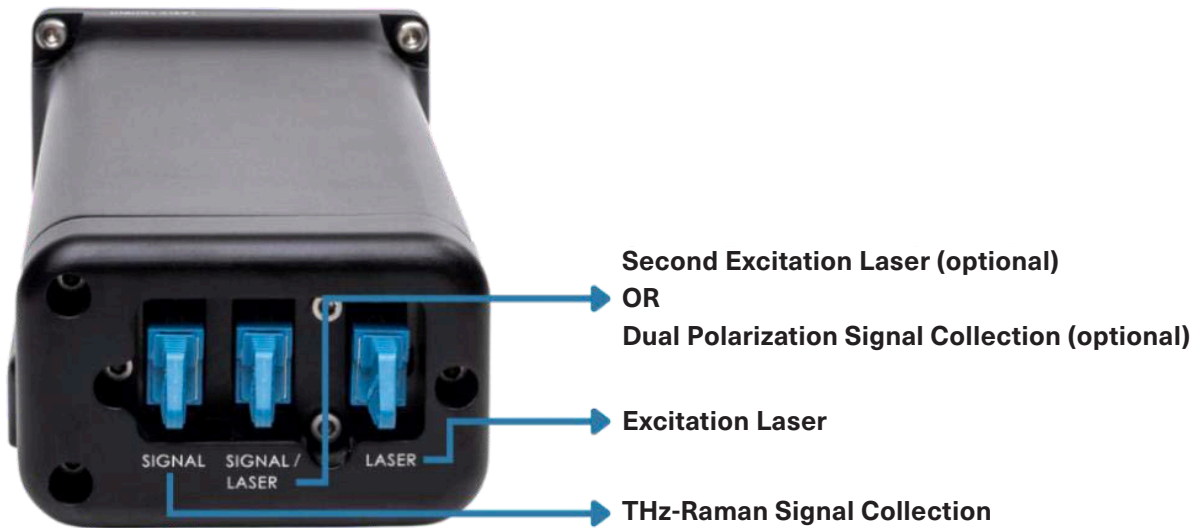
Integrate with SCHOTT's ViewPort® bioreactor interface, which provides a sterile and safe interface for in-situ process monitoring with optical sensors.

## Integrated Spectroscopy Systems

Probe Specifications	TR-PROBE			
	Single Wavelength Excitation			Dual Wavelength Excitation
Wavelength (nm)	532	785	830	830 + 638
Power at Sample Port (mW)	75 (single mode)	50 (single mode) 300 (multi-mode)	300 (multi-mode)	100 (638 nm, multi-mode) 300 (830 nm, multi-mode)
Spectrograph Specifications	TR-ACC-SPEC			
Spectral Range (nm)	740 to 1040 nm	-770 to +3120 $\text{cm}^{-1}$ at 785 nm -1460 to +2430 $\text{cm}^{-1}$ at 830 nm +2160 to +3550 $\text{cm}^{-1}$ at 638 nm		
Resolution	3.3 - 6.3 $\text{cm}^{-1}$ (0.4 nm, typical with 20 $\mu\text{m}$ slit)			
Physical Specifications	TR-PROBE	CleanLine	TR-ACC-SPEC	
Weight (kg)	1.6	3.5	6.9	
Physical Dimensions <sup>1</sup> (mm) (L x W x H)	215.9 x 76.2 x 58.4	229 x 199 x 89	266 x 155 x 162	

Notes:

1. Probe head only, does not include sample accessory.



## Mechanical Specifications

### TR-PROBE

