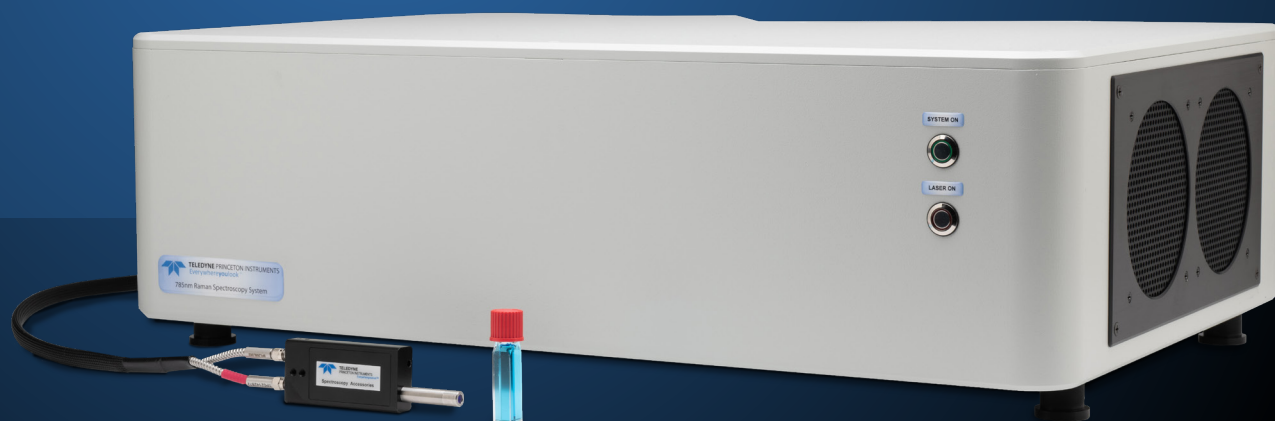


TPIR-785 Raman

Highest-Sensitivity Raman Spectrometer



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Why NIR Raman?

Benefits

Autofluorescence from biological specimens introduces severe interference to UV/VIS Raman spectral data and obscures the analysis results.

Working with longer-wavelength excitation lasers (e.g., 785 nm and 830 nm) can reduce or eliminate the fluorescence background. Longer-wavelength light penetrates much deeper than UV/VIS light. Raman spectral data generated using NIR lasers provides the biochemical information needed to perform the most accurate subcutaneous, tissue, and tumor analysis.

Why is a highly sensitive spectrometer an absolute requirement for NIR Raman?

Challenges

Raman signal strength decreases with longer-wavelength excitation lasers because the spontaneous Raman scattering cross-section is proportional to $1/\lambda^4$. Furthermore, highly photosensitive biological samples prohibit the use of higher-power lasers.

The sensitivity of conventional CCD sensors starts to decrease significantly in the NIR spectral region. In contrast, InGaAs sensors afford better coverage in the NIR but lack sensitivity from 700 nm to 1000 nm and suffer from much higher dark noise than silicon-based sensors.

Teledyne Princeton Instruments has been providing limitation-shattering cameras and spectrographs to the research community for decades. Now, with the TPIR-785 Raman, we have combined myriad leading-edge technological innovations to build our first truly integrated Raman spectrometer.



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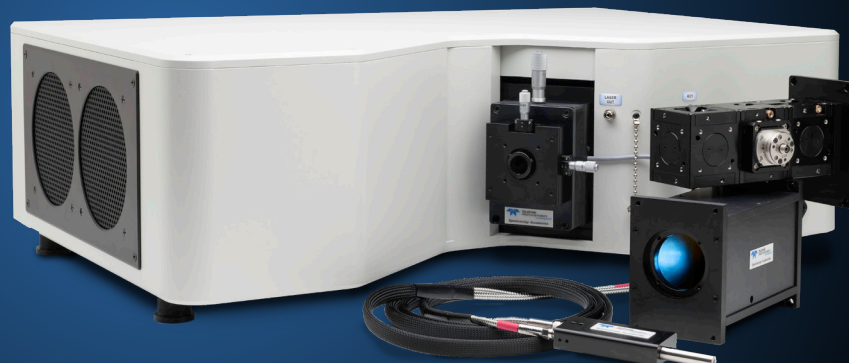


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TPIR-785 Configurations

TPIR-785 Raman systems come with a variety of accessories to fit your research and application needs.

- » Sampling accessories for a broad range of sample formats
- » Switching between accessories is quick and easy
- » Flexible adaptor and filter chamber for customized setup



Standard Configuration

785 nm Raman probe

- » Point-and-shoot operation
- » Choice of FC/PC or SMA connectors to choose from
- » Round-to-linear collection fiber bundle for best efficiency
- » Universal fiber adaptor can accept different fiber inputs (including customized probes)



Routine Sample Measurement

785 nm Raman cuvette holder

- » Based on proprietary CUBE accessories
- » Pre-aligned CUBE stack has built-in 785 nm Raman filters and focusing optics
- » Plug and play without the need for alignment
- » Ideal for routine sample measurement



Filter Chamber Configuration

Extended functionality

- » Most flexible setup for different spectroscopic measurements
- » Filter chamber has built-in focusing and collimation optics and accepts standard 25 mm diameter filters
- » Expands system functionality beyond 785 nm Raman
- » Universal fiber adaptor can accept different fiber inputs



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TPIR-785 Raman Advantages

Designed by Teledyne Princeton Instruments with the most advanced spectrograph and camera technologies for the ultimate in sensitivity...

The TPIR-785 Raman delivers unparalleled performance¹ to facilitate successful research and application development.

» FINGERPRINT

Spectral data contains a wealth of chemical and physical information for qualitative and quantitative analyses

» SAMPLES

Works for both pure and mixture samples in various formats: gases, liquids, gels, tissues, solids, semi-solids, and powders with minimal or no sample preparation

» EFFICIENCY

Fast and reproducible results

» MEASUREMENT

Noninvasive and nondestructive measurement makes it a perfect technology for many challenging biomedical, pharmaceutical, and security applications

» EASE OF USE

Flexible fiber-coupled Raman probe and pushbutton data collection

» HIGHEST LIGHT THROUGHPUT

f/2 spectrograph with custom-designed lens optics provides the highest throughput and imaging quality in the NIR

» SUPER NIR SENSITIVITY²

3x higher NIR sensitivity in large-format CCD camera:
>70% QE at 1000 nm

» EXCELON ENHANCEMENT³

New eXcelon 4 technology optimized in NIR spectral range for even better QE and fringe elimination

» DEEPEST COOLING²

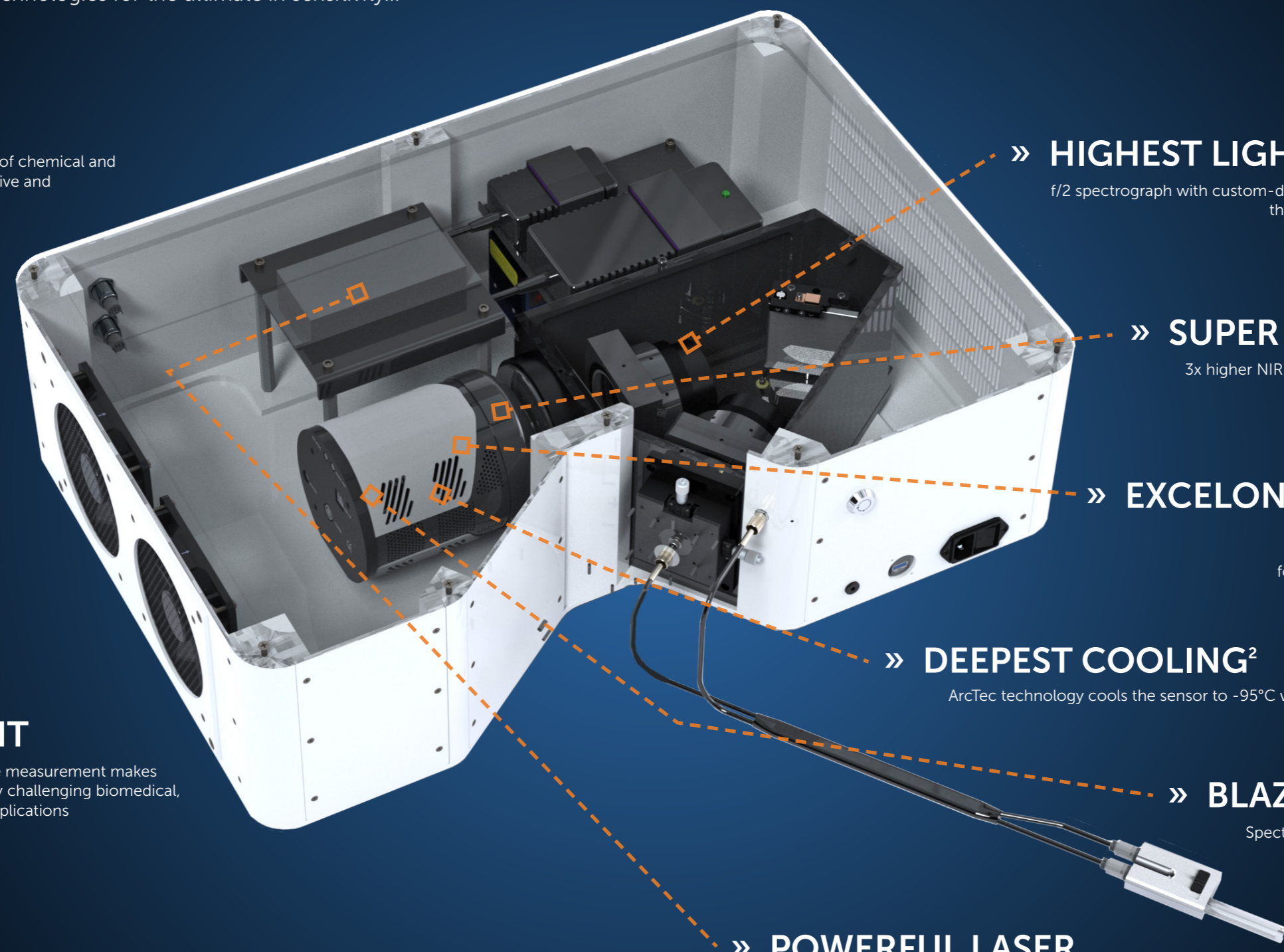
ArcTec technology cools the sensor to -95°C with air for lowest dark current

» BLAZING FAST SPEED²

Spectral rate > 1 kHz with a readout speed up to 16 MHz and two readout ports

» POWERFUL LASER

High-power and temperature-stabilized 785 nm laser



¹ estimated >60% better light throughput than VPH system
² for BLAZE HR option
³ for PIXIS BR EX4 option

SPECIFICATIONS

Spectrograph	
Aperture ratio	f/2
Spectral resolution	5 cm ⁻¹ (High Resolution*); 7.8 cm ⁻¹ (Extended Coverage**)
Spectral range	80 – 2250 cm ⁻¹ (High Resolution*); 80 – 3650 cm ⁻¹ (Extended Coverage**)
Total system throughput	>68%
Laser***	Temperature-stabilized 785 nm multi-mode laser; 475 mW (software adjustable)
Integration time	10 μs – hours

*with 1200 g/mm grating and 10 μm slit width

**with 830 g/mm grating and 10 μm slit width

***contact your sales engineer for other excitation laser wavelengths

Detectors	
Standard (PIXIS 100/400 BR EX4)	Scientific CCD with eXcelon™ 4 technology; Eliminates fringes and improves QE in the NIR range; 1340 x 100/400 pixel array with 20 x 20 μm pixel size; -80°C cooling for low dark current
High QE (BLAZE® 100/400 HR)	Proprietary scientific CCD delivers superior NIR QE; 1340 x 100/400 pixel array with 20 x 20 μm pixel size; -95°C cooling for ultralow dark current

Accessories / System	
785 nm Raman probe	Stainless steel probe head with anodized aluminum body; 10 mm focal length; Round-to-linear fiber bundle for high light-collection efficiency
Universal fiber adaptor	Accommodates SMA, FC/PC, or 10 mm ferrules
Slit	Manual adjustable slit (10 μm – 3 mm)
IntelliCal®	Automated wavelength and intensity calibration (optional)
CUBES	CUBES accessories for other Raman and spectroscopic setups (optional)
Raman notch filter chamber	Flexible filter chamber for Raman setups (optional)
Software	LightField® for system control and data collection; SDKs in Python® (Python Software Foundation), LabVIEW® (National Instruments), and MATLAB® (MathWorks)
Connectivity	USB 3.0
Operating temperature	+5°C to +30°C
Storage temperature	-20°C to +50°C
Size	24" x 17 3/8" x 7 3/8" (61 cm x 44 cm x 19 cm)
Weight	60 lbs. (27 kg)

Specifications are subject to change.

Applications

Biology & Medical Research

- Early-stage cancer diagnostics and tumor tissue mapping
- Bacteria and microbial identification
- Drug delivery and toxicology
- Plant health and disease monitoring

Materials Research

- 2D and nanomaterials research
- Perovskite and other novel materials for solar energy harvest

OVER 40 YEARS
OF INNOVATION

Petroleum & Chemical

- Mixture content analysis of crude oil and natural gas
- Process and reaction development and monitoring

Environment

- Water and airborne contaminants detection
- Microplastic identification
- Emission and effluent monitoring

Forensic, Security & Military

- Narcotics, explosives, and chemical identification
- Trace chemical analysis for gunshot residue, blood, and body fluids
- Ink and paint analysis for fraudulent documents identification
- Standoff IED detection

Pharmaceutical, Food & Agriculture

- Anti-counterfeiting of drug and food
- Product quality check
- Raw material inspection
- Process development and monitoring

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