



# picoraman M3

Real-time process monitoring,  
improved product quality,  
and faster time to market  
for biopharmaceuticals

 timegate

# What is new in PicoRaman M3?

Fluorescence emission is seen as the main challenge in Raman spectroscopy. The patented, new Timegated® technology is developed to solve this issue.



## Advantages

PicoRaman spectrometers **open new opportunities** for material research in the various fields of science and process industries, where fluorescence emission has previously been problematic for successful Raman analyses. Timegated® Raman technology allows **effective fluorescence reduction** over the conventional CW (continuous wave) Raman technologies. The reduction of fluorescence from the Raman signal **improves SNR - Signal-to-noise-Ratio**. In turn, the improved SNR simplifies and adds robustness to the chemometric

models. Now, we can see what has not been seen before! In addition to fluorescence rejection, time-gated technology also **works in ambient light** and the measurements of materials and reactions, e.g. in high temperature processes with high thermal emissions succeed easily. Raman signal together with time-resolved fluorescence data provides **fresh basis for advanced data analysis**. In total, the PicoRaman M3 enables about 10 to 40 times faster measurements than our previous instrument generations.

1

Wider **application areas** than ever because of effective fluorescence rejection.

2

Wider **operation areas** than ever because ambient light and thermal emission do not interfere the measurement.

3

**More data** than ever with combined Raman and time-resolved fluorescence data.

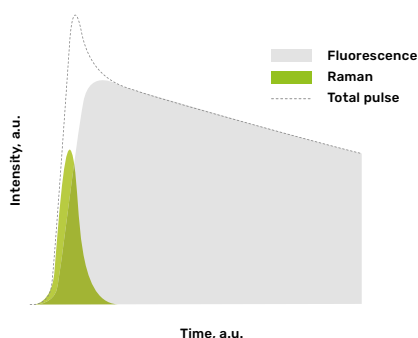
# New Innovation for Raman Analysis

Fluorescence emission is seen as the main challenge for achieving detailed Raman analysis data. The patented, new Timegated® technology is developed to solve this issue.



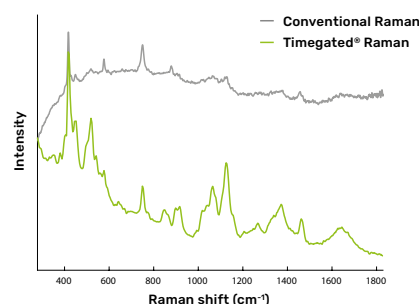
## Technical solution

Raman scattering and fluorescence emission phenomena differ in time scale. Raman scattering occurs fast, within sub picoseconds time scale, whereas fluorescence emission has much longer decay times. Our technology uses timegating to both differentiate the fluorescence and Raman signals, and additionally gives temporal information on both.



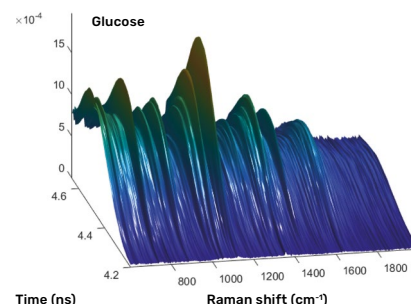
Raman Scattering and Fluorescence Emission as a function of time.

New Timegated® Raman spectrometer is equipped with 100 picosecond pulsed excitation and time-resolved single-photon counting detector array, enabling effective, real fluorescence rejection from Raman signal and making both quantitative and qualitative Raman spectroscopy analysis more accurate. Spectral analysis becomes more specific and reliable as fluorescence is no longer a disturbance.



Comparison of conventional and Timegated® Raman spectra of fermentation process.

In addition to effective fluorescence rejection, Timegated® Raman measurement approach provides a totally new data dimension - time. In addition to spectral wavelength axis, we can now see also how photons occur in time dimension. This brings totally new features and benefits to Raman spectroscopic analyses. In addition to the data of Raman scattering, PicoRaman M3 provides time-resolved information on fluorescence emission decay.



3D data cube of time-gated data.



# Fast and Easy Material Characterization with Molecular Fingerprinting

Raman spectroscopy is a very powerful technique for material characterization in wide application areas due to its beneficial features including intrinsically high molecular specificity, the requirement for minimal or no sample pre-treatment, the ability to measure complex (biological) solutions, immunity to high water content, the flexibility of sampling configurations, and suitability for automation. Furthermore, Raman technology has useful properties of being nondestructive, non-contact, label-free, fast and robust way of measurement, making the use of the technique very convenient and easy.

## Outstanding features of PicoRaman M3

- Faster measurements
- Real-time, online
- Highly specific chemical information
- Concentration quantification
- Compact, portable solution on-site
- Better integration with process environment
- OEM-modules can be installed
- User-friendly customer interface
- No sample preparation
- Non-destructive analysis

Fluorescence has been one of the problems in our measurements and analyses of biomolecules before we got access to time-gated Raman technology. Previously, we were unable to measure the Raman spectra of some small-molecule drugs and biomolecules, due to their high fluorescence background. Currently, with time-gated Raman spectrometer we have succeeded by detecting the Raman spectra of the fluorescent molecules. In addition, we were able to distinguish the extracellular vesicles (EVs) from different cellular origins based on their Raman spectra and principal component analyses, which was not achievable earlier with continuous wave Raman spectroscopy. As we have overcome various problems with time-gated Raman, we have already acquired the first and second generation instruments, and now we are collecting the funds to purchase the Microprobe to further widen our research. Time-gated Raman spectroscopy is highly advanced, sensitive and user friendly technology for biopharmaceutical measurements.

**Marjo Yliperttula**, University of Helsinki

# PicoRaman M3 Specifications

## SPECTROMETER

Spectral resolution	6-7 $\text{cm}^{-1}$
Spectral range	< 200-2500 $\text{cm}^{-1}$ (with probe) 0-2500 $\text{cm}^{-1}$ (spectrometer only)

## DETECTOR

Detector type	Proprietary CMOS SPAD matrix, single photon counting
Spectral points	1536
Time resolution	50 ps

## 532 NM PICOSECOND PULSED LASER

Spectral line width	< 0.1 nm
Pulse width	< 100 ps
Pulse energy	SW control up to 1 $\mu\text{J}$
Repetition rate	150 kHz (dependent on the laser unit type)
Laser power	SW controlled up to ~100mW at laser port

## PHYSICAL

Spectrometer dimensions	425 mm(W) x 335 mm(D) x 160 mm(H)
Weight	10 kg
Operating Conditions	Normal laboratory environment

## SAMPLE CUBE WITH LAB RAMAN PROBE

- Convenient and safe measurement of solid, liquid and powder samples
- Top and side inlets for the probe
- Motorized sample rotation with speed control
- Accurate focus adjustment using thumbscrews

\* The spectrograph does not contain laser blocking filters.

PicoRaman M3 is fiber coupled spectrometer with FC connectors.  
Several Raman probe or microscope sampling interfaces available.



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# Be faster than your fluorescence



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