WITec
focus innovations

StrobeLock

Time-Correlated Single Photon Counting Module for FLIM and TLM

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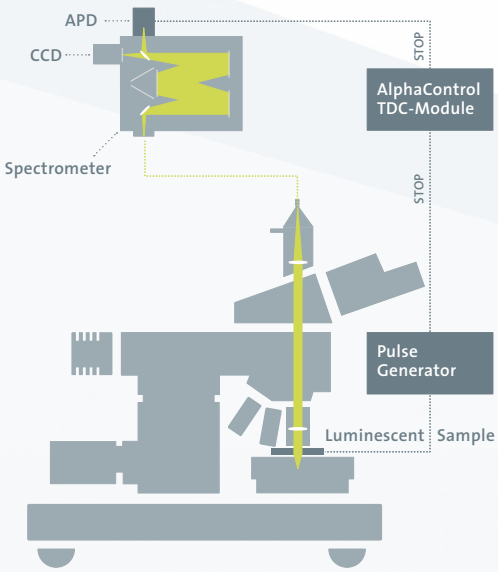
StrobeLock is a WITec extension for the most accurate time-correlated single photon counting measurements. The available imaging modes include Fluorescence Lifetime Imaging and Time-resolved Luminescence Microscopy, which can be integrated with the WITec alpha300 and alpha500 microscope series.

This combination facilitates the acquisition of additional material contrasts hidden in the time function of a fluorescence or luminescence signal and allows them to be perfectly linked with Raman, SNOM or AFM imaging. It enables a variety of measurement possibilities for an improved and more comprehensive understanding of a sample's properties. StrobeLock is comprised of a pulsed excitation laser combined with a Time-Correlated Single-Photon Counting (TCSPC) detector. The ability to switch between time-resolved and conventional mode allows the microscope user to conveniently choose the preferred measurement technique. The StrobeLock electronics are integrated into WITec's control unit, alphaControl, allowing the seamless linkage of the time-correlated measurements. Detectors and excitation lasers are perfectly adjusted to the WITec microscope series for imaging sensitivity and ease-of-use.

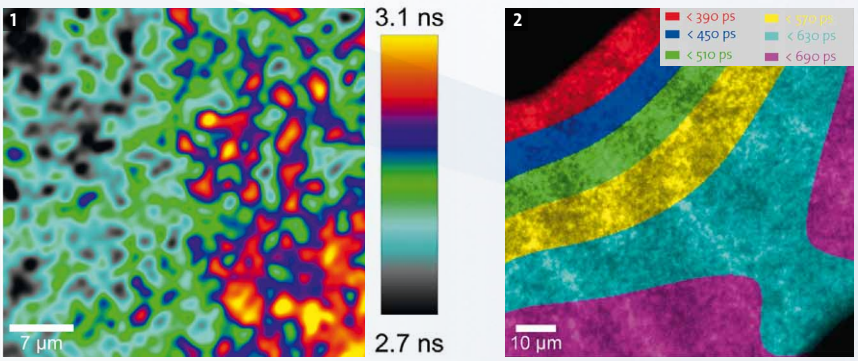
TLM

StrobeLock Time-resolved Luminescence Microscopy (TLM)

Time-resolved Luminescence Microscopy (TLM) determines luminescence decay over time after stimulation. This technique increases the possibilities e.g. for characterization and quality control of a sample.



Microscopic setup for Time-resolved Luminescence Microscopy (TLM)

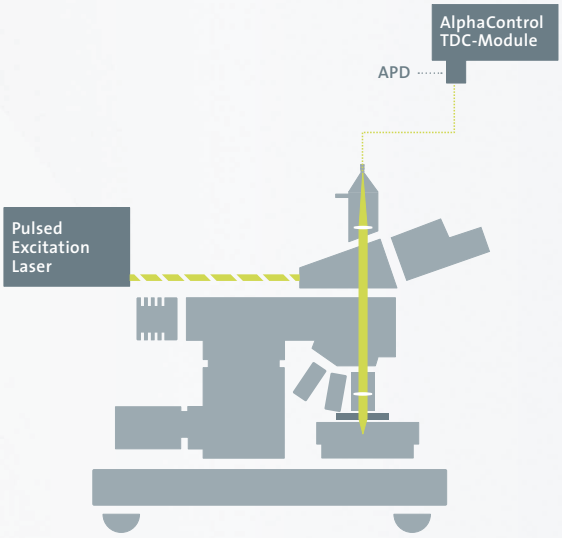


TLM on a blue light-emitting diode (LED)
1 Map of local relaxation times of the LED aquired through spatially-resolved time spectra measurement.
2 Counter plot of the temporal luminescence emission start of the LED.

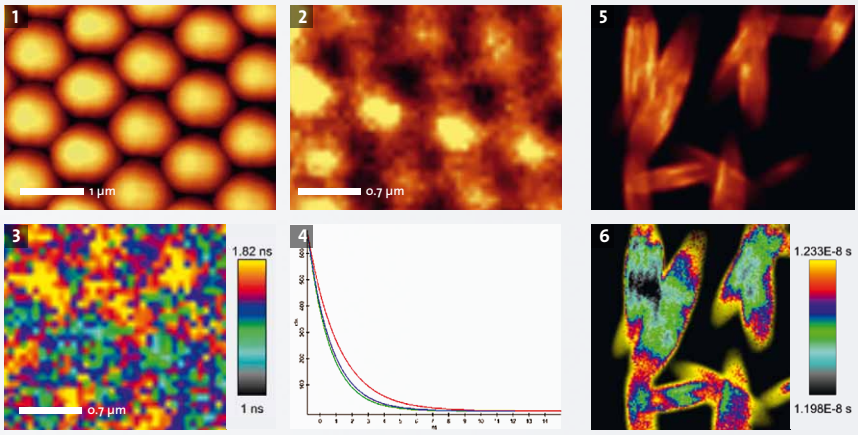
FLIM

StrobeLock Fluorescence Lifetime Imaging (FLIM)

Fluorescence Lifetime Imaging (FLIM) determines fluorescence decay over time. In combination with other WITec imaging techniques it greatly extends the amount of information acquired from one sample and is specifically suited for materials science applications.

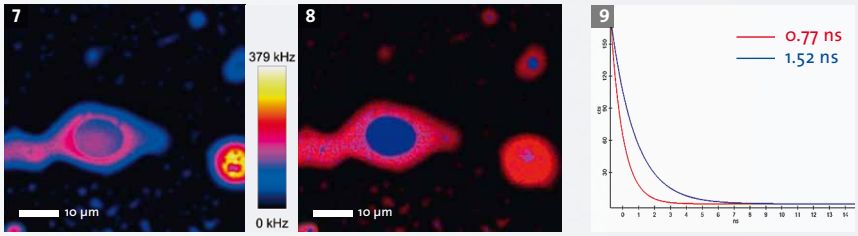


Microscopic setup for Fluorescence Lifetime Imaging (FLIM).



Cadmium selenite nano crystals on a patterned Au substrate
1 AFM topographic image
2 Total Fluorescence intensity
3 FLIM
4 Corresponding FLIM decay curves

EPPTC crystal needles*
5 Total Fluorescence intensity
6 FLIM



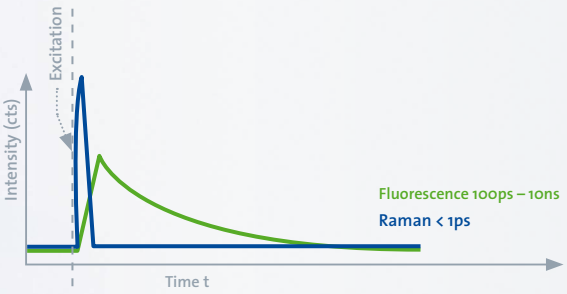
Mixture of nano materials and dyes
7 Total Fluorescence intensity
8 Average lifetime (FLIM)
9 Average decay curves

*Images courtesy of Xingping Zhang, Institute of Information Photonics Technology and College of Applied Sciences, Beijing University of Technology

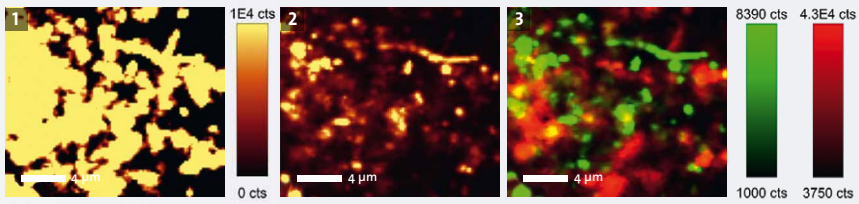
ADVANCED APPLICATION

StrobeLock Raman Fluorescence Separation (RFS)

StrobeLock's highly accurate and sensitive measurement features allow the separation of a Raman signal from the fluorescence signal. While the emission time of a fluorescence signal is between 100ps and 10ns, the Raman signal shows a faster emission time below 1ps. This difference enables Raman Fluorescence Separation (RFS) to effectively detect the Raman signal isolated from fluorescence. The technique has already been successfully demonstrated on a variety of samples.



Raman Intensity over time compared to the Fluorescence Intensity.



Raman Fluorescence Separation (RFS) on cadmium sulfite nanowires. The slow Fluorescence **(1)** and fast Raman **(2)** signal can be detected separately. The merged picture **(3)** shows the Raman Image (green) combined with the Fluorescence Image (red).

Example of a microscope with StrobeLock. Installation of StrobeLock on the microscope can be adjusted differently according to application requirements.

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FEATURES & BENEFITS

- Extension for alpha300 and alpha500 microscope series: Time-Correlated Single Photon Counting Module for FLIM and TLM
- Developed for advanced materials research to detect additional material characteristics
- User-friendly combination options with Raman, SNOM and AFM for enhanced measurement techniques
- Ease-of-use through full integration with the alphaControl hardware and WITec Project Software environment
- Microscope configurations, types of lasers and detectors, and applied frequencies are highly adjustable according to the user's requirements
- Flexible laser pulse frequencies for FLIM and TLM ideally matching the sample properties (up to > 100 MHz)
- Instrument response function typically below 120ps for high measurement sensitivity and accuracy

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