JenLab Experts in Femtosecond Laser Technology

TauMap™

Fluorescence Lifetime Microscope (S)FLIM / FCS / FRET

Time-resolved fluorescence imaging of single cells, cell monolayers and tissues for biological, pharmaceutical and medical research:

- fluorescence lifetime imaging (FLIM)
- second harmonic generation (SHG) and two-photon fluorescence microscopy
- intravital imaging of molecular and ion dynamics
- visualization of protein interactions in living cells
- fluorescence resonance energy transfer (FRET)
- fluorescence correlation spectroscopy (FCS)
- spectral FLIM – (S)FLIM

JenLab GmbH

TauMap™

A system for fluorescence lifetime imaging with submicron spatial resolution

Product description

TauMap™ combines high resolution three-dimensional tomography with fluorescence lifetime imaging (FLIM). This results in 4D-x,y,z,τ-mapping of fluorophores with submicron spatial and sub nanosecond temporal resolution. Using this novel imaging system, in situ drug monitoring and fluorescence resonance energy transfer (FRET) can be performed in living cells and histological sections.

The device is based on a conventional fluorescence microscope. It is equipped with a high-speed galvo-scanning module as well as an ultrafast detection unit. High numerical aperture (NA 1.3) objectives enable fluorescence imaging with sub-cellular spatial resolution. TauMap™ uses a time-correlated single photon counting (TCSPC) module for data acquisition. The detection unit consists of fast photomultiplier tubes (PMT) for temporal resolutions of 200 ps. The compact system TauMap™ is fully computer controlled and includes JenLab scan software and SPC image data analysis software for data acquisition and image processing.

Applications

TauMap™ offers non-invasive in vivo three-dimensional mapping of fluorescence decay times in cells with submicron spatial and 50 ps/ 200 ps temporal resolution even in tissue depths of 200 µm.
The system enables scientists to observe living cells and even single organelles. The use of FLIM technology allows research on molecular and protein interactions as well as signalling cascades in single cells or between cells in a tissue.
Fluorescence kinetics are a characteristic parameter which can be used to distinguish different fluorophores. TauMap™ opens the possibility for high resolution initu 3D drug monitoring by non-invasive FLIM technology.
The fluorescence decay time (τ) of a fluorophore depends on its local environment. Since the lifetime is often independent of the concentration, FLIM is a direct indicator of binding effects and energy transfers overcoming respective problems faced in fluorescence intensity measurements. The high temporal resolution of the TCSPC unit enables TauMap™ to study fluorescence resonant energy transfer (FRET, FLIM-FRET) without phototoxic reactions that can be used for research on intracellular protein-protein interactions.

By connecting a spectral imaging device to TauMap™ additional information on the spectral distribution per pixel can be obtained (5D imaging).

Technology

Fluorescent proteins, molecular probes and various endogenous biomolecules are excitable by ultrashort laser pulses. The fluorescence is characterized by specific decay kinetics which can be used to distinguish between the fluorescent components and to obtain information on the microenvironment.

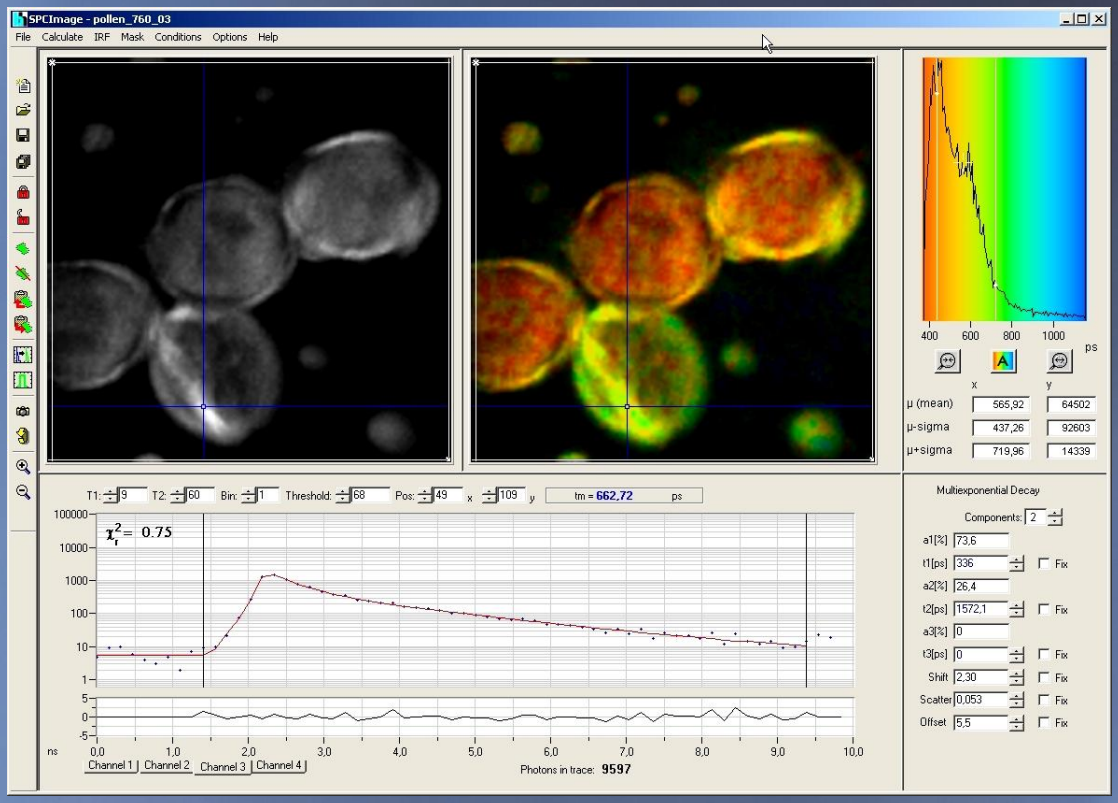
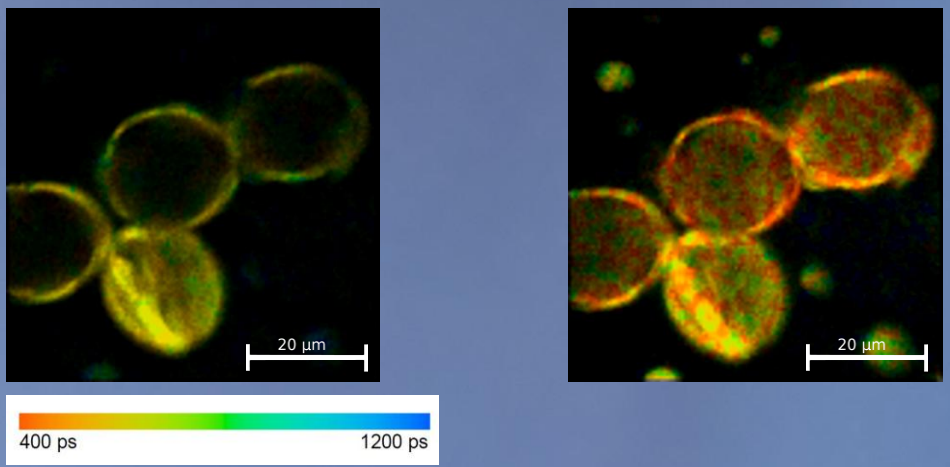


Fig. 1: Fluorescence lifetime image of *liriodendron tulipifera* pollen and data analysis by TCSPC Image software (509 nm – 594 nm)

TauMap™ provides 3D fluorescence lifetime measurements (FLIM) for a spatial mapping of fluorescent molecules. The use of time correlated single photon counting (TCSPC) enables a temporal resolution of 50 ps/ 250 ps with single photon sensitivity to detect even slight changes in fluorescence lifetime as well as second harmonic generation (SHG). The system is optimized for near infrared femtosecond laser pulses but can also be used in combination with UV/ VIS ultrashort pulsed lasers.



Figs. 2 and 3: color image of *liriodendron tulipifera* pollen
Left: 375 mn – 425 nm Right: 425 nm – 509 nm

Technical data

- full-frame scanning, region-of-interest (ROI) scanning, line scanning, single-point illumination (spot scan)

• typical scan range:	350 x 350 µm (horizontal) 200 µm (vertical)
• spatial resolution:	< 1 µm (horizontal) < 2 µm (vertical)
• temporal resolution:	50 ps (MCP) / 200 ps (PMT)

- video adapter for visualization with CCD-camera
- control and image processing software (JenLab Image)

• operating temperature:	15 - 35 °C (59 - 95 °F)
• relative humidity:	5 - 95 % (non-condensing)
• power requirements:	230 VAC (50 Hz) or 115 VAC (60 Hz)

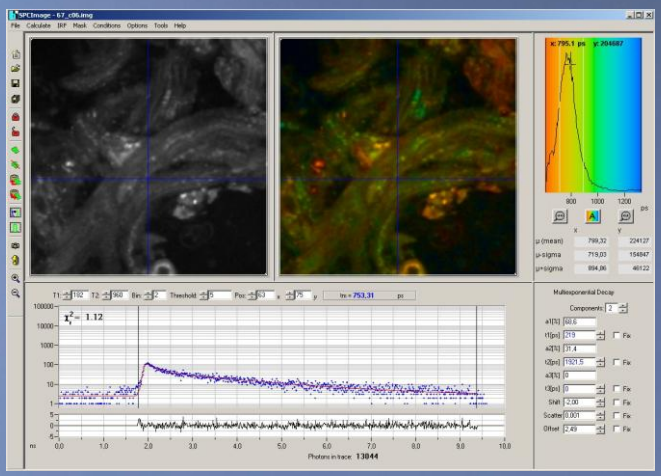
- CE certified

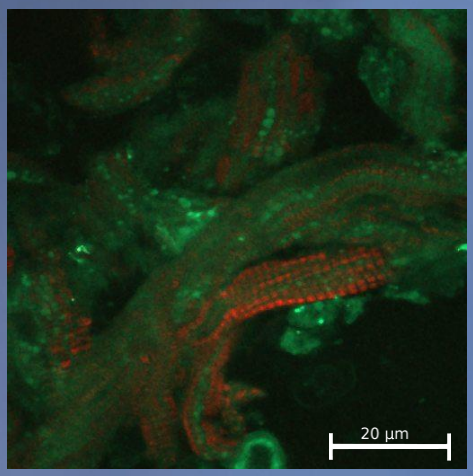
system dimensions

• stand:	590 x 295 x 640 mm³, 26 kg
• scan module:	280 x 190 x 90 mm³, 6 kg
• control unit:	450 x 300 x 130 mm³, 8 kg

Laser sources on demand.
Air-conditioning is recommended. For operation reduce ambient light.
The system requires an air conditioned room with reduced ambient light.

These specifications are subject to change without notice.





Figs. 4 and 5: Fluorescence lifetime image, SHG / autofluorescence image of biological tissue

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