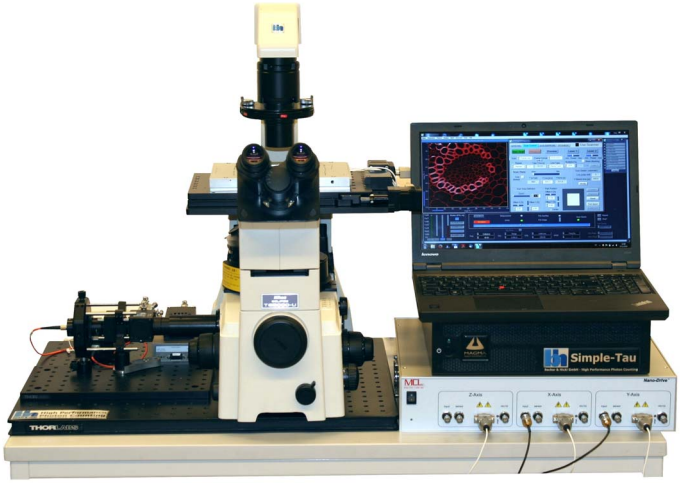
PZ-FLIM-110 Piezo Scanning FLIM System

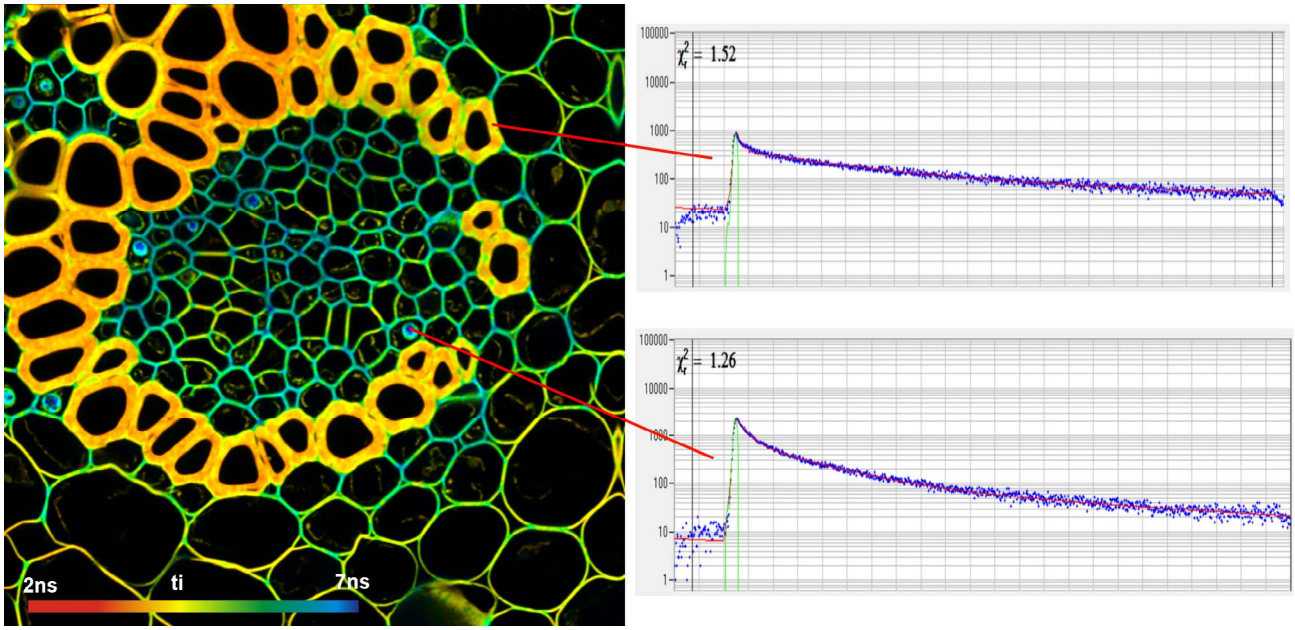
Based on bh's Megapixel FLIM Technology

Complete FLIM Microscopes
FLIM Upgrades for Existing Microscopes

Multidimensional TCSPC technique
Sample Scanning by Piezo Stage
Compact Electronics, Controlled by Laptop Computer
Fully Integrated Scanner Control



Confocal detection
Suppression of out-of-focus light
Suppression of lateral scattering
Excellent contrast and resolution
Excitation by bh BDL or BDS series picosecond diode laser
Laser wavelengths 375nm, 405 nm, 445 nm, 473 nm, 488 nm, 515 nm, 640 nm, 685 nm, 785 nm
Compatible with supercontinuum lasers
64-bit SPCM Software for Windows 7, 8, 10



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More than 22 years experience in multi-dimensional TCSPC. More than 1500 TCSPC systems worldwide.

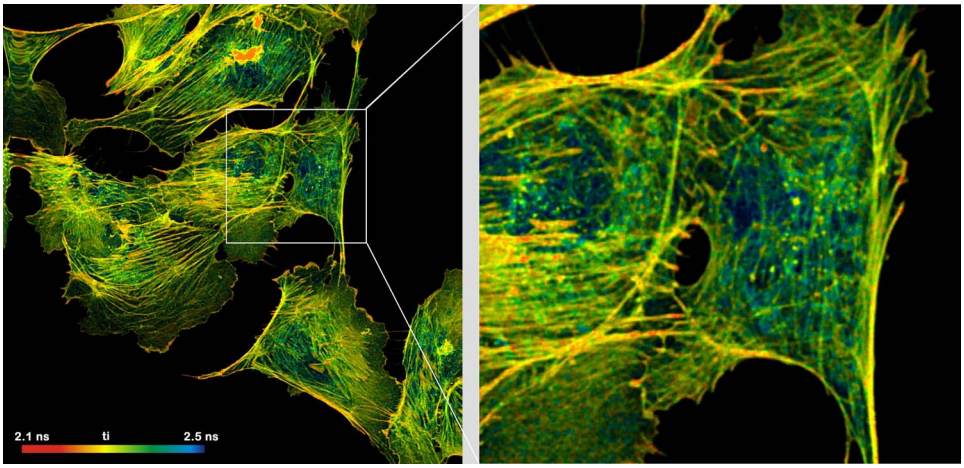
PZ-FLIM-110 Piezo Scanning FLIM System

Megapixel FLIM Technology

Record Images with up to 2048 x 2048 pixels

Record FLIM data of a large number of cells under identical conditions

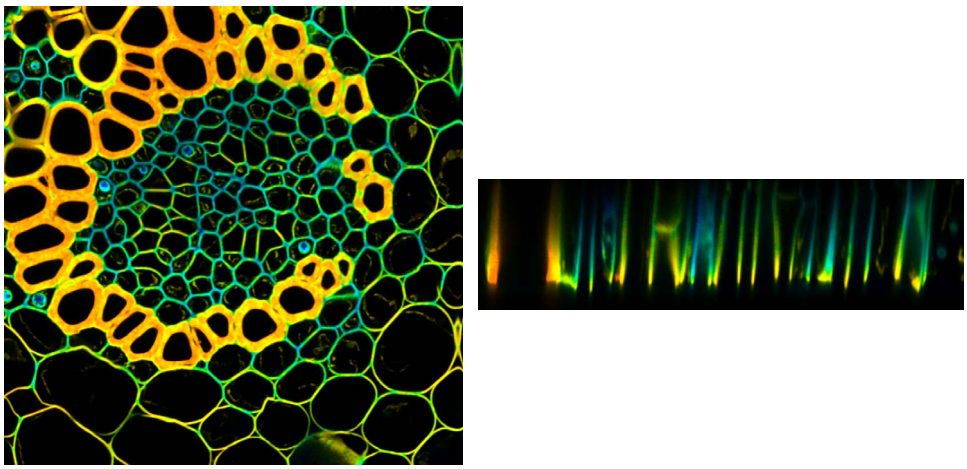
Select regions of interest from recorded data of a large field of view



Lateral and Vertical Scanning

Select between a scan in the x-y plane or a scan in the x-z plane

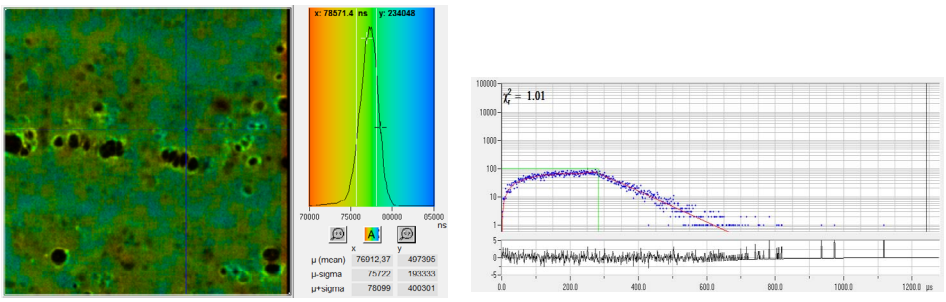
Run a vertical scan within a fraction of the time needed for a full Z stack



Phosphorescence Lifetime Imaging Simultaneously with FLIM

Obtain unprecedented PLIM sensitivity by multi-pulse excitation

Record phosphorescence and fluorescence lifetime images simultaneously



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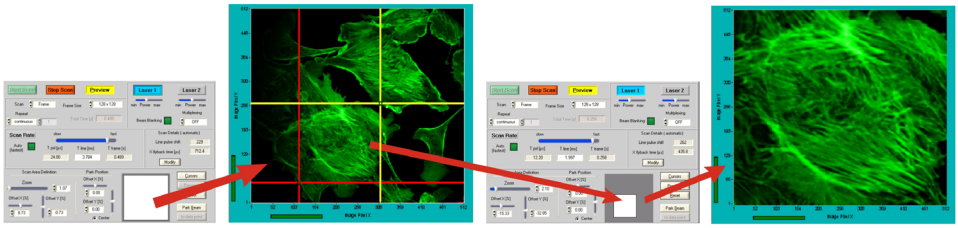
Interactive Scanner Control

Conveniently select scan field, pixel numbers, and scan speed

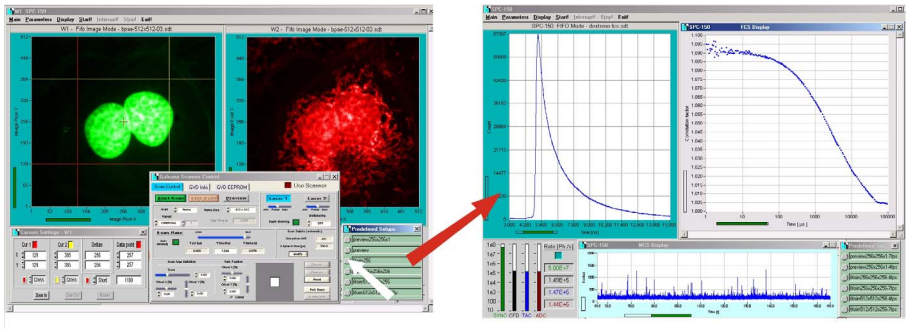
Select a region of interest within a previously recorded image

Record an image of the region selected



Predefined Setups

Pass from one operation mode or system configuration to another by selecting from a list of 'Predefined Setups'



Precision FLIM and PLIM Data Analysis

Analyse FLIM and PLIM data pixel by pixel

No need to record an IRF

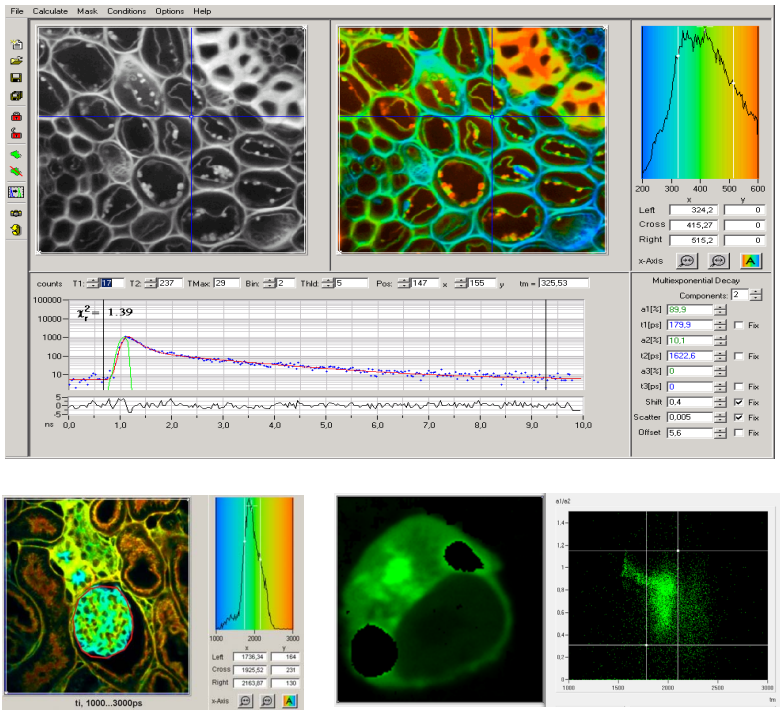
Up to three exponential decay components

Calculate lifetimes and amplitudes of decay components

Calculate ratios of lifetimes or amplitudes, fractional intensities, FRET efficiencies

Calulate 1D and 2D histograms of decay parameters over the pixels

Analyse large data volumes by batch processing



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PZ-FLIM-110 Piezo Scanning FLIM System

System Components

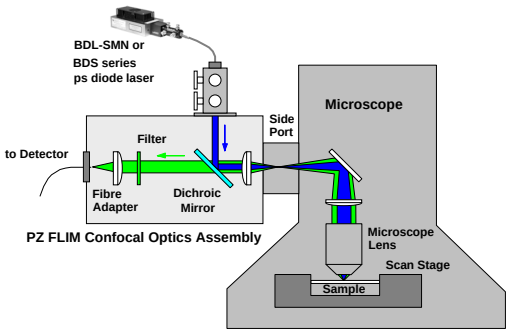
Laser
High power
High repetition rate
Single-mode fibre coupling

BDL-SMN series

BDS-SM Series

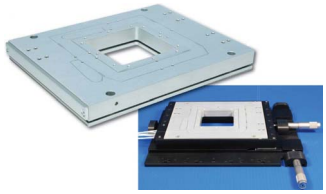
Repetition rates	20 MHz, 50 MHz, 80 MHz, CW	20 MHz, 50 MHz, CW
Available wavelengths	375nm, 405 nm, 445 nm, 473 nm, 488 nm, 515nm, 640nm, 685nm, 785nm	
Pulse width	typ. 60 ps, depending on wavelength version and power	

PZ FLIM Confocal Optics Assembly



Laser input	Qioptiq Kineflex fibre manipulator
Excitation / Emission Beamsplitter	Dichroic, different transition wavelength available
Emission Filter	In filter slider, long-pass and bandpass filters available
Output to detector	Multi-mode fibre, FCS connector
Confocal pinhole	Core diameter of detector fibre

Scan Stage **Mad City Labs Nano View 200-3** [1]



Detector	**Id 100-50-FC SPAD (Standard)**	**HPM-100-40 (optional)**[4]	**MW FLIM GaAsP (optional)**[4]
			
Wavelength Range	400nm to 1000nm	400 nm to 700 nm	400 nm to 700 nm
Wavelength Channels	1	1	16

TCSPC Module	**SPC-150 (Standard)**	**SPC-150N (Optional)**	**SPC-160 (Optional)**
			

Scan Control Module

GVD-120

Generation of scan signals	Hardware, digital signal synthesis
Image size	16 x 16 to 2048 x 2048 pixels
Laser multiplexing	Inside pixel, line by line, or frame by frame[2]
Laser on/off for PLIM	Selectable in % of pixel time
Beam park function	Any location within scan area

System Computer and Electronics Box

Lap-top PC with PCI-extension box	Extension box contains: SPC-150, SPC-150N, SPC-160 TCSPC modules GVD-120 scan controller DCC-100 detector controller (optional)
Also available:	SPC, GVD, and DCC modules installed in standard PC

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PZ-FLIM-110 Piezo Scanning FLIM System

Specifications

Scanning	**Mad City Labs Nano-View 200-3** [1]
Optical principle	Sample scanning by piezo stage, confocal detection
Laser input	Single-mode fibre coupled, Qioptiq fibre coupling system
Output to detector	Fibre coupling, FC connector, multi-mode fibre
Main beamsplitter	Dichroic Mirror
Pinhole	Pinhole is core of detection fibre
Emission filter	Filter slider
Connection to microscope	adapter to left side port
Scan Controller	**bh GVD-120**
Principle	Digital waveform generation, scan waveforms generated by hardware [1]
Scan waveform	Linear ramp with cycloid flyback. Parameters configurable for different scanners
Scan format	line, frame, or single point
Frame size, frame scan	16x16 to 2048x2048 pixels
Line scan	16 to 2048 pixels
X scan	continuous or pixel-by-pixel
Y scan	line by line
Laser power control, electrical	via electrical signal to lasers
Laser multiplexing [2]	frame by frame, line by line, or within one pixel
Beam blanking	during flyback and when scan is stopped
Scan rate	automatic selection of fastest possible rate or manual selection
Fastest scan rate with piezo stage [3]	5 lines / second
Scan area definition	via zoom and offset or interactive via image cursors
Beam park position	selectable via cursor in FLIM image
Laser control	On/off, power, wavelength multiplexing [2]
Excitation Source	**bh BDL-SMC Series or BDS-Series picosecond diode laser**
Available Wavelengths	375nm, 405nm, 445nm, 473nm, 488nm, 510nm, 640nm, 685nm, 785nm
Pulse width, typical	40 to 70 ps
Pulse frequency	BDL-Series: 20MHZ, 50MHz, 80MHz BDS Series: 20 MHZ, 50 MHz
Power in picosecond mode	Typ. 0.2 mW to 2 mW injected into fibre. Depends on wavelength version
Fast on/off modulation	< 1µs, for PLIM and excitation wavelength multiplexing[2]
Detector (standard)	**Id Quantique id100-50-FC SPAD**
Spectral Range	400 to 1000 nm
Peak quantum efficiency	50%
IRF width with bh diode laser	70 to 130 ps
Background count rate, thermal	Typ. 100 to 200. LN version with <10 available
Power supply	6V wall-mounted power supply
Detector (optional)	**bh HPM-100-40 hybrid detector [1]** [4]
Spectral Range	400 to 700nm
Cathode type	GaAsP
Peak quantum efficiency	40 to 50%
IRF width with bh diode laser	120 to 130 ps
Background count rate, thermal	300 to 2000 counts per second
Background from afterpulsing	not detectable
Power supply and overload shutdown	via DCC-100 controller of TCSPC system
Detector (optional)	**bh Multi-Wavelength MW-FLIM Detector [1]** [4]
No. of wavelength channels	16
Wavelength channel width	12.5 nm, other on requets
Spectral Range	200 nm within a range of 400 to 700nm
Cathode type	GaAsP
IRF width with bh diode laser	250 ps
Power supply and overload shutdown	via DCC-100 controller of TCSPC system

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TCSPC System	**bh SPC-150, SPC-150N, or SPC-160 module, see [1] for details**			
Principle	Advanced TAC/ADC principle			
Electrical timing jitter	2.3 ps rms			
Electrical IRF width	6.8 ps FWHM			
Minimum time channel width	813 fs			
Dead time	100 ns (80 ns for SPC-160)			
Saturated count rate	10 MHz (12 MHz for SPC-160)			
Dual-time-base operation	via micro times from TAC and via macro time clock			
Source of macro time clock	internal 40MHz clock or from laser			
Input from detector	constant-fraction discriminator			
Reference (SYNC) input	constant-fraction discriminator			
Synchronisation with scanning	via frame clock, line clock and pixel clock pulses			
Scan rate	any scan rate [3], automatic accumulation of frames			
Synchronisation with laser multiplexing [2]	via routing function			
Recording of multi-wavelength data [5]	simultaneous in all wavelength channels, via routing function			
Basic acquisition principles, see [1]	on-board-buildup of photon distributions			
	buildup of photon distributions in computer memory			
	generation of parameter-tagged single-photon data			
	online auto or cross correlation and PCH			
Operation modes, see [1]	f(t), oscilloscope, f(txy), f(t,T), f(t) continuous flow			
	FIFO (correlation / FCS / MCS) mode			
	Scan Sync In imaging, Scan Sync In with continuous flow			
	FIFO imaging, with MCS imaging, mosaic imaging [6], time-series imaging [6]			
	Multi-wavelength operation [5], laser multiplexing operation [2]			
	cycle and repeat function, autosave function			
Max. Image size, pixels (SPCM 64 bit software)	2048x2048	1024x1024	512x512	256x256
Max. no of time channels, see [1]	256	1024	4096	4096

SPCM Data Acquisition Software, please see [1] for details

Operating system	Windows 7, Windows 8, or Windows 10, 64 bit
Loading of system configuration	single click in predefined-setup panel
Start / stop of measurement	by operator or by timer, starts with start of scan, stops with end of current frame
Online calculation and display, FLIM, PLIM	in intervals of Display Time, min. 1 second
Online calculation and display, FCS, PCH	in intervals of Display Time, min. 1 second
Number of images diplayed simultaneously	max 8
Number of curves (Decay, FCS, PCH, Multiscaler)	8 in one curve window
Cycle, repeat, autosave functions	user-defined, used for
	for time-series recording [6], Z stack FLIM [6],
	microscope-controlled time series
Saving of measurement data	User command or autosave function
	Optional saving of parameter-tagged single-photon data
Link to SPCImage data analysis	automatically after end of measurement or by user command

SPCImage FLIM and PLIM Data Analysis, please see [1] for details

Data types	FLIM, PLIM, single fluorescence or phosphorescence decay curves
Decay models	Single-, double-, triple-exponential decay models, incomplete decay models, first moment
Procedure	Iterative convolution or direct calculation by first moment
	Batch processing for multi-file FLIM data
Parameters delivered by analysis	lifetimes of components, amplitudes, ratios of amplitudes or lifetimes,
	FRET efficiency, fractional intensities of decay components
Display	Colour-coded images of decay parameters
	Histogram of decay parameters over pixels
	2D histograms of decay parameters, phasor plot

Remarks

1. Other scan stages on request. Stage controller must have analog inputs.
2. Laser multiplexing requires second laser and single-mode beam combiner.
3. Limited by piezo stage. Fastest system scan rate depends on stage type. Configurable for different stages.
4. Requires DCC-100 detector controller card.
5. Requires MW FLIM detector.
6. Limited applicability due to slow scan rate of piezo stage.

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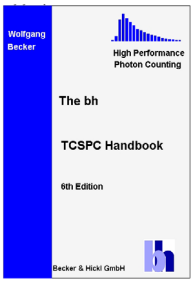
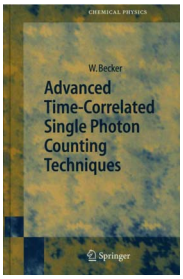
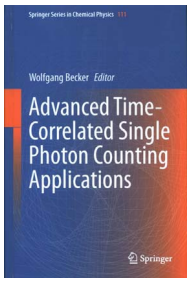
Literature (please contact bh for printed copies)

1. The bh TCSPC Handbook, www.becker-hickl.com
2. W. Becker, Advanced Time-correlated single photon counting techniques. Springer 2005
3. W. Becker (ed.), Advanced time-correlated single photon counting applications. Springer (2015)
4. The PZ-FLIM piezo-scanning FLIM system. Application note, available on www.becker-hickl.com







Related Products

DCS-120 Confocal Scanning FLIM Systems
- Scanning by fast galvanometer mirrors
- 2 laser channels, 2 detector channels
- FLIM, Multi-Wavelength FLIM, PLIM, Z Stack FLIM, Fast Time-Series by temporal mosaic FLIM

DCS-120 MACRO System
-Imaging of cm-size objects
- Scanning by fast galvanometer mirrors
- 2 laser channels, 2 detector channels
- FLIM, Multi-Wavelength FLIM, PLIM, Z Stack FLIM, Fast Time-Series by temporal mosaic FLIM

Modular FLIM Systems for Zeiss LSM 710 / 780 / 880 Family Laser Scanning Microscopes
- Fast galvanometer scanning
- One or two ps diode lasers
- Multiphoton excitation by Ti:Sa laser
- Confocal detection or NDD detection
- One, two, three, or four detection channels
- FLIM, Multi-wavelength FLIM, PLIM, Lateral Mosaic FLIM, Z Stack FLIM, Fast Time-Series by temporal mosaic FLIM

Modular FLIM Systems for Zeiss LSM 510 NLO Family Laser Scanning Microscopes
- Fast galvanometer scanning
- Multiphoton excitation
- One or two NDD detection channels
- FLIM, Multi-wavelength FLIM, Lateral Mosaic FLIM, Z Stack FLIM, Fast Time-Series by Temporal Mosaic FLIM

Modular FLIM Systems for Leica, Nikon, Olympus Laser Scanning Microscopes
- Fast galvanometer scanning
- Diode laser excitation and multiphoton excitation
- Various system configurations, please see Handbook [1]

International Sales Representatives

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