



FLIM Systems for Laser Scanning Microscopes

Based on bh's Fast Multi-Dimensional TCSPC Technique

FLIM for Laser Scanning Microscopes of all Manufacturers

Multiphoton NDD FLIM

Confocal FLIM

Upright and Inverted Microscopes

Ultra-high sensitivity

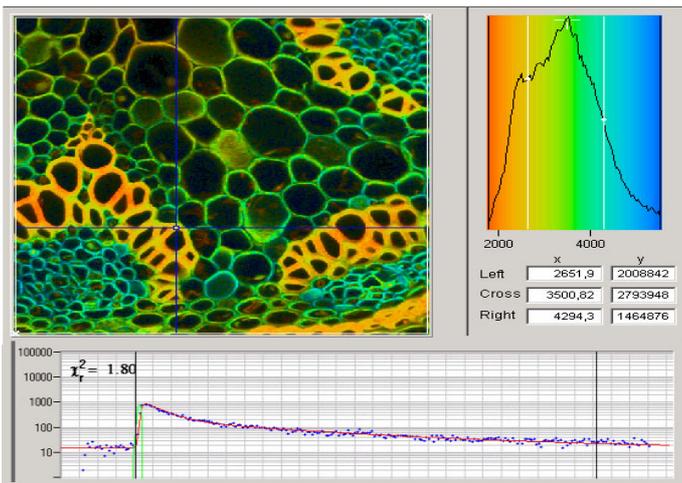
GaAsP hybrid detectors

MCP PMTs

Single-detector systems

Dual-detector systems

Multi-spectral FLIM systems



Simultaneous detection in all wavelength channels

Parallel TCSPC systems for dual-detector systems

High count rate

Short acquisition time

Sequential recording by memory swapping

Time-series FLIM as fast as 2 images / second

Time-tag and histogram modes

FCS recording, online-correlation and fit

Extremely large images by FIFO imaging mode

Fast preview in all FLIM modes

Single, double, triple-exponential decay analysis

Multi-spectral decay analysis

FRET measurement without bleedthrough

Double-exponential FRET: Separation of interacting and non-interacting protein fractions

Autofluorescence of cells and tissue

Ion concentration measurements



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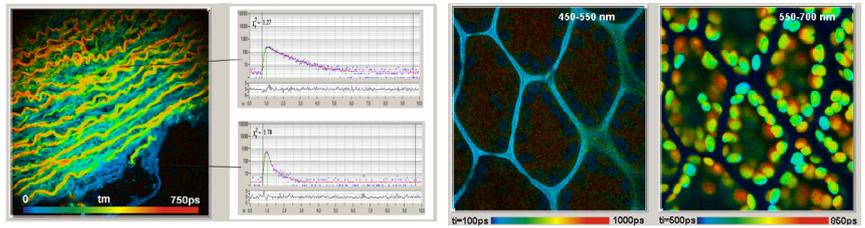
Covered by patents DE 43 39 784 and DE 43 39 787



FLIM Systems for Laser Scanning Microscopes

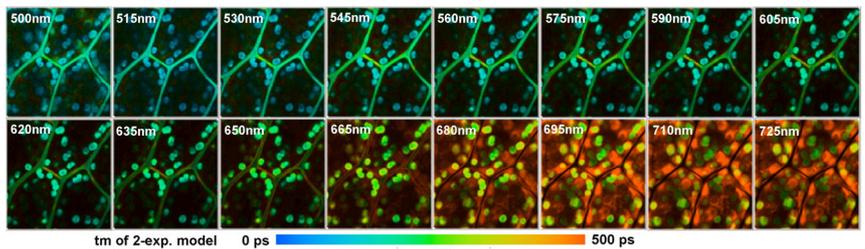
Multiphoton NDD FLIM

- GaAsP Hybrid detectors
- SPAD-like sensitivity combined with deep-tissue imaging capability
- Single channel systems
- Dual channel systems, fully parallel detection in two wavelength channels



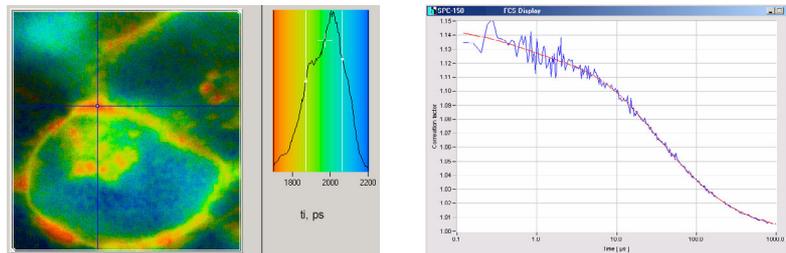
Multiphoton NDD Multispectral FLIM

- The world's first multiphoton, multispectral NDD FLIM system
- Simultaneous detection in 16 wavelength channels
- No wavelength scanning, no time gating
- Near-ideal recording efficiency



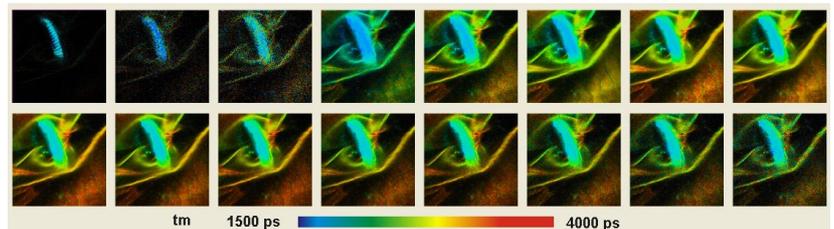
Confocal FLIM

- Hybrid detectors: SPAD-like sensitivity
- No afterpulsing, no diffusion tail
- No alignment needed
- Highly efficient FCS from a single detector
- Large area, no alignment needed
- Efficient collection of light even from large pinholes



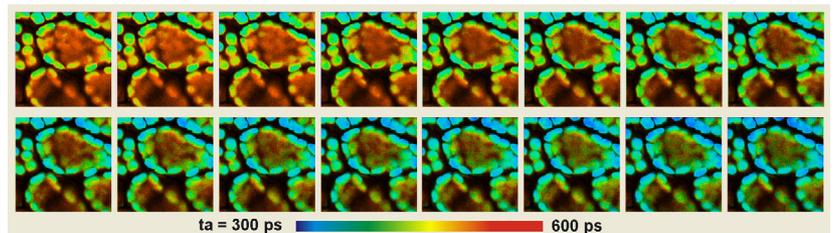
Confocal Multispectral FLIM

- Simultaneous detection in 16 wavelength channels
- Near-ideal recording efficiency
- No wavelength scanning, no time gating
- Maximum SNR at minimum sample exposure



Time-Series FLIM

- Time-series down to 2 images per second



More than 15 years experience in multi-dimensional TCSPC. More than 1300 TCSPC systems worldwide



FLIM Systems for Laser Scanning Microscopes

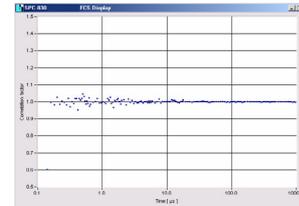
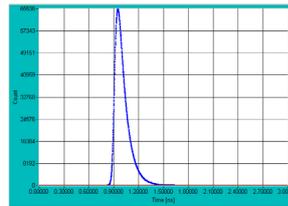
bh Simple-Tau 150, 152, 154 TCSPC FLIM systems

Highly Flexible. Modular. Upgradable. Small and portable. Single channel, dual-channel, four-channel parallel acquisition FLIM. Confocal FLIM, multiphoton FLIM, NDD FLIM, multispectral FLIM, time-series FLIM, FCS. No matter what kind of FLIM, the TCSPC systems are compatible.



bh HPM-100-40 GaAsP hybrid detector modules

SPAD-like sensitivity combined with the large active area of a PMT
High count rate, fast response, no afterpulsing, no diffusion tail. The perfect FLIM detector.



bh PMC-100 and PMZ-100 PMT modules

Small, fast, rugged. The detector that never gets tired.



bh BDL series picosecond diode lasers
405 nm, 445 nm, 473 nm, 488 nm, 640 nm. Picosecond or CW mode. Free beam or high efficiency single-mode fibre coupling. Point-Source coupler or fibre pigtail. Designed and manufactured in cooperation with



bh MW FLIM multi-wavelength detector

Detect simultaneously in 16 wavelength channels
Adapters for NDD ports, confocal ports, and fibre ports



More than 15 years experience in multi-dimensional TCSPC. More than 1300 TCSPC systems worldwide.



FLIM Systems for Laser Scanning Microscopes

TCSPC Technique (Standard FLIM Systems)

	Single-Detector Systems	Dual-Detector Systems	Multi-Spectral Systems
TCSPC system	Simple-Tau 150	Simple-Tau 152	Simple-Tau 150
Components	Lap-top computer PCI extension box SPC-150 TCSPC module DCC-100 detector controller	Lap-top computer PCI extension box Two SPC-150 TCSPC modules DCC-100 detector controller	Lap-top computer PCI extension box SPC-150 TCSPC module DCC-100 detector controller
IRF width, electrical	2.5 ps rms / 8 ps fwhm	2.5 ps rms / 8 ps fwhm	2.5 ps rms / 8 ps fwhm
min. time-channel width	820 fs	820 fs	820 fs
Saturated count rate	10 MHz	20 MHz	10 MHz
Sustained count rate			
Scan Sync In mode	10 MHz	20 MHz	10 MHz
FIFO Imaging Mode	4 MHz	4 MHz	4 MHz
Scan rate	any	any	any
Scan synchronisation	via pixel clock, line clock and frame clock in all imaging modes		
Zoom	automatic zoom with zoom in microscope		
Online display	in programmable intervals, 1 second or larger		
Max. image size			
FIFO Img. Mode	130 MBytes	260 MBytes	130 Mbytes
$pxl_x \times pxl_y \times \Delta t$	256x256x1024	2x 256x256x1024	16x 256x256x64
(examples)	512x512x256 1024x1024x64	2x 2x512x512x256 2x 2x1024x1024x64	16x 128x128x256
Max. image size			
Scan Sync In Mode	4 MBytes	2 x 4 Mbytes	4 Mbytes
$pxl_x \times pxl_y \times \Delta t$	256x256x64	2x 256x256x64	16x 128x128x64
(examples)	128x128x256	2x 128x128x256	
Requirements to Microscope	Non-decanned port must be available		
MP NDD FLIM	Input fibre for laser must be available or pulsed laser must be installed		
Confocal (VIS) FLIM	Confocal output must be available: Direct-coupled port or fibre port		

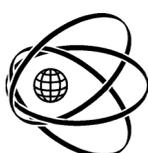
Other FLIM configurations

Please note that the bh FLIM systems are highly modular. Therefore a large number of different FLIM system configurations are possible. Please see [1] for details or contact bh.

Literature:

- [1] The bh TCSPC Handbook, www.becker-hickl.com
- [2] W. Becker, Advanced Time-correlated single photon counting techniques. Springer 2005
- [3] The HPM-100-40 hybrid detector. Application note, available on www.becker-hickl.com

Please contact bh for printed copies



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