

# Multi-Spectral FLIM System MS-FLIM

Fluorescence lifetime imaging with spectral resolution

Picosecond time resolution

Based on BH's multi-dimensional TCSPC technique

Ultra-high sensitivity due to simultaneous detection in all time and wavelength channels

Adapters for confocal microscopes

Adapters for non-descanned outputs of multiphoton microscopes

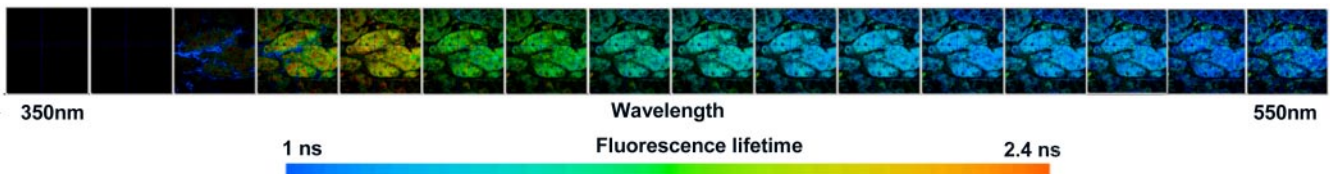
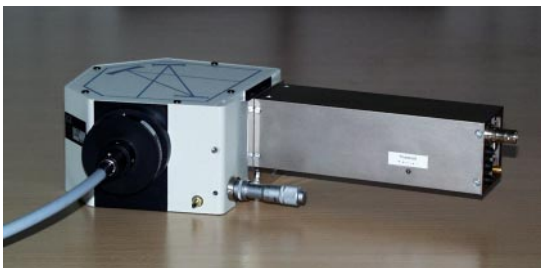
Upgrade for existing bh FLIM systems

Separation of fluorophores by fluorescence lifetime and spectrum

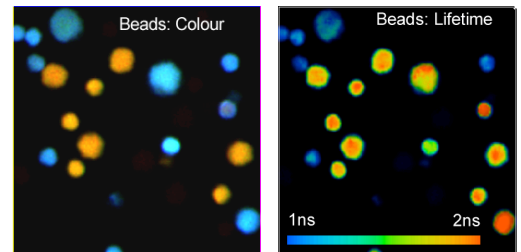
Autofluorescence imaging of tissue

FRET experiments

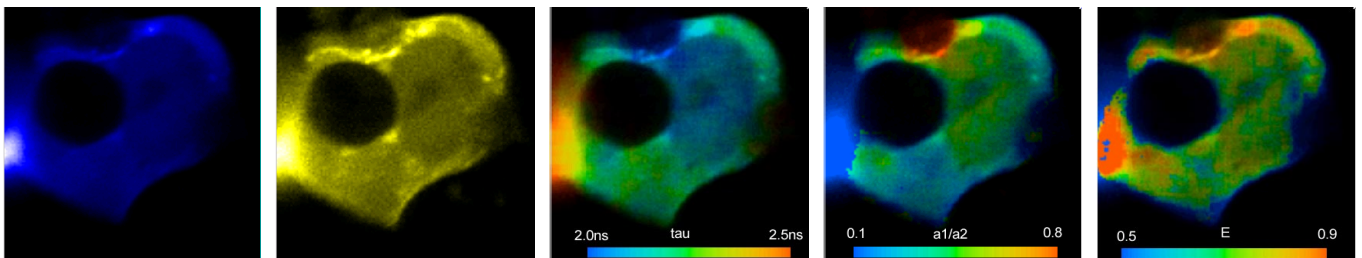
Combined Lifetime / SHG imaging



The MW-FLIM system is based on a 16-channel multi-anode PMT detector module in combination with a polychromator and BH's proprietary multi-dimensional TCSPC technique. A fibre bundle is used to transfer the light from the microscope into the entrance slit of the polychromator. Due to the large light collection area a high efficiency is obtained both for confocal detection and for non-descanned (direct) detection in multiphoton microscopes. Typical applications are multi-spectral autofluorescence imaging in deep tissue, pH imaging in tissue, combined FLIM and SHG imaging, and investigation of protein interaction by FRET.



Protein interaction in live cells: FRET, Cerulean-YFP



Donor  
Cerulean

Acceptor  
YFP

Lifetime of donor

Fraction of  
interacting proteins

FRET Efficiency



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# Multi-Spectral FLIM System MS-FLIM

## Part List

M-SHUT field lens and shutter assembly <sup>1)</sup>  
 MW-FLIM fibre bundle  
 MW-FLIM fibre adapter to spectrograph  
 LOT MS125 spectrograph  
 PML-16-0-C (300 to 600 nm) or PML-16-1-C (300 to 800 nm) 16 channel PMT module, with MS125 adapter

## TCSPC Technique required

SPC-830 or SPC-150 TCSPC module <sup>2)</sup> or Simple-Tau 830 or 150 stand-alone TCSPC system <sup>3)</sup>  
 DCC-100 detector controller <sup>2)</sup>  
 SPC-830 standard cable set  
 SPC-830 scan control cable <sup>1)</sup>  
 SPCImage FLIM data analysis software

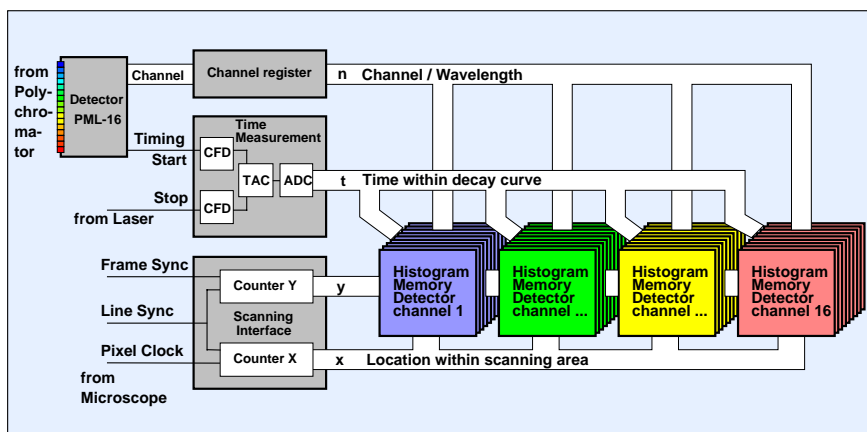
- 1) please specify microscope type and configuration in your order  
 2) PC cards, to be inserted in a Pentium PC  
 3) Laptop based stand-alone system, contains SPC-830 or SPC-150 and DCC-100

## Wavelength range and resolution

Grating Part No.	Primary wavelength region adjustable by set screw <sup>4)</sup>	Width of recorded wavelength interval, channel 1 to 16	Blaze Wavelength
77417	340-820 nm	300 nm	500 nm
77414 (standard)	340-820 nm	200 nm	400 nm
77411	340-820 nm	100 nm	350 nm

4) for PML-16-1, may vary due to transmission range of microscope optics

The setup employs BH's multi-dimensional TCSPC technique featuring multi-wavelength capability, high count rate, near-ideal counting efficiency, low differential nonlinearity, and ultra-high time-resolution. It contains the usual building blocks (CFDs, TAC, ADC) in the 'reversed start-stop' configuration together with a scanning interface and a large histogram memory integrated on a single PC board. For each photon the TCSPC module determines the time within the fluorescence decay function,  $t$ , the wavelength,  $\lambda$ , and the location within the scanning area,  $x$  and  $y$ . These values are used to address a memory in which the events are accumulated. Thus, in the memory the distribution of the photon density over  $X$ ,  $Y$ ,  $\lambda$ , and  $t$  builds up. With a 16-channel detector, the result contains 16 data sets for different wavelength, each containing a large number of images for different time in the fluorescence decay curve. The recording process runs at any scan rate, including ultra-high rates of resonance scanners.



MW-FLIM: Principle of data acquisition

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

## For more information please download or call for

W. Becker, The bh TCSPC Handbook, 2006  
 PML-16-C User Handbook  
 Handbooks of bh FLIM systems for Zeiss, Leica, and Olympus Laser Scanning Microscopes



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