Simple-Tau 152   Table-Top TCSPC Systems

Dual-channel time-correlated single photon counting systems in lap-top format

Two fully parallel SPC-150 TCSPC Channels

Laptop computer with extension box
Coupled via fast bus extension interface
Two SPC-150 TCSPC modules
Detectors controlled via DCC-100 controller
Picosecond time resolution
Time channel width down to 813 fs
Electronic IRF (Jitter) 6.6 ps fwhm, 2.5 ps rms
Unprecedented count rate
Unprecedented timing stability
Photon distribution and time-tag modes
Standard fluorescence decay recording
Fast triggered sequential recording
Unlimited sequential recording by memory swapping
FLIM by bh Megapixel Technology
High-throughput FLIM
Mosaic FLIM, PLIM, FLITS
Multi-spectral FLIM
fNIRS, NIRS, diffuse optical correlation
FCS, FCCS, single-molecule spectroscopy
64-bit operating software
Windows XP, Windows 7, Windows 8

400 ps — 800 ps
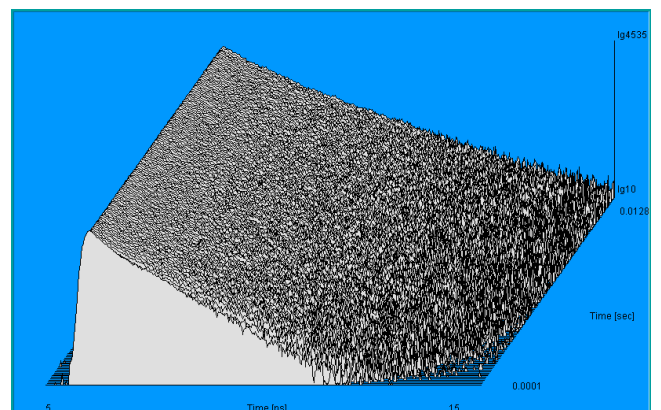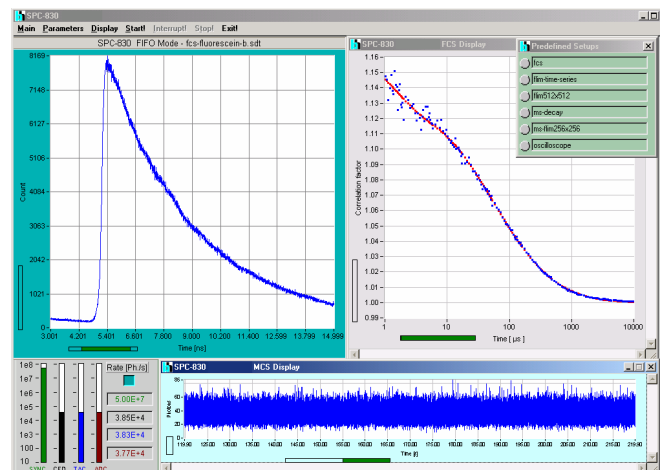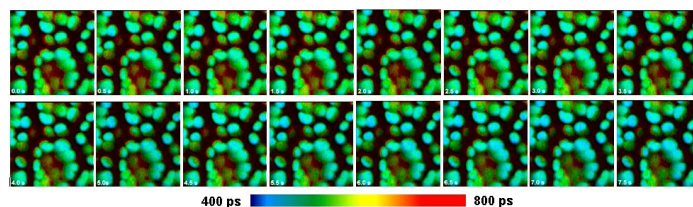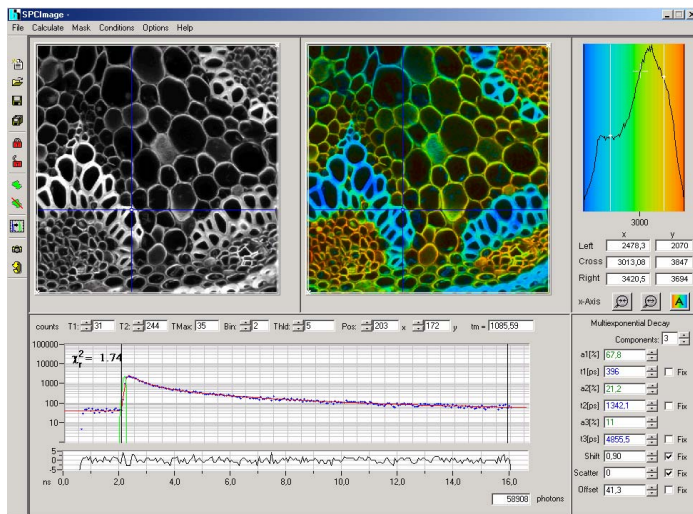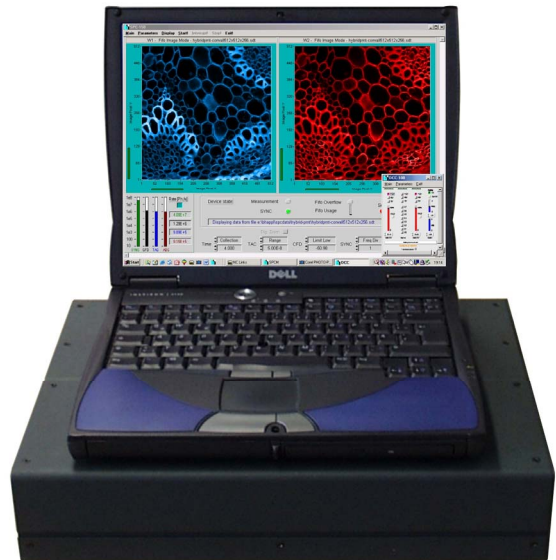
Covered by patents DE 43 39 784 and DE 43 39 787

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Simple-Tau 152 Table-Top TCSPC Systems

Photon Channels
Principle	Constant Fraction Discriminator (CFD)
Electronic Time Resolution (Jitter, FWHM / RMS)	6.6 ps / 2.5 ps
Opt. Input Voltage Range	- 30 mV to - 1 V
Min. Input Pulse Width	400 ps
Lower Threshold	0 to - 500 mV
Zero Cross Adjust	- 100 mV to + 100 mV

Synchronisation Channels
Principle	Constant Fraction Discriminator (CFD)
Opt. Input Voltage Range	- 30 mV to - 1 V
Min. Input Pulse Width	400 ps
Threshold	0 to -500 mV
Frequency Range	0 to 150 MHz
Frequency Divider	1-2-4
Zero Cross Adjust	-100 mV to + 100 mV

Time-to-Amplitude Converters / ADCs
Principle	Ramp Generator / Biased Amplifier
TAC Range	50 ns to 5 us
Biased Amplifier Gain	1 to 15
Biased Amplifier Offset	0 to 100% of TAC Range
Time Range incl. Biased Amplifier	3.3 ns to 5 us
min. Time / Channel	813 fs
ADC Principle	50 ns Flash ADC with Error Correction
Diff. Nonlinearity	< 0.5% rms, typ. <1% peak-peak

SPC-150
830 fs per channel

Electrical Response
6.6 ps fwhm
2.5 ps rms

Data Acquisition (Histogram Mode)
Method		on-board multi-dimensional histogramming process					
Dead Time		100ns, independent of computer speed					
Saturated Count Rate, per TCSPC channel / total		10 MHz / 20 MHz					
Useful count rate, per TCSPC channel / total		5 MHz / 10 MHz					
Number of Time Channels / Pixel	1	4	16	64	256	1024	4096
Image Resolution (pixels), 1 Detector Channel	2048 x 2048	1024 x 1024	512 x 512	256 x 256	128 x 128	64 x 64	32 x 32
max. Counts / Time Channel		2^{16}-1					
Overflow Control		none / stop / repeat and correct					
Collection Time		0.1 us to 10000 s					
Display Interval Time		100ms to 1000 s					
Repeat Time		0.1 us to 1000 s					
Sequential Recording		Programmable Hardware Sequencer, unlimited recording by memory swapping, in curve mode and scan mode					
Synchronisation with scanning		pixel, line and frame clocks from scanning microscope					
Curve Control (external Routing)		4 bit TTL					
Count Enable Control		1 bit TTL					
Experiment Trigger		TTL					

Data Acquisition (FIFO / Time-Tag Mode)
Method	Time-tagging of individual photons and continuous writing to disk			
Online Display	Decay function, FCS, Cross-FCS, PCH, MCS traces, images			
Waveform recording	online from time-tag data, up to 16 detector channels			
FCS calculation	Multi-tau algorithm, online calculation and online fit			
Image Acquisition in time-tag mode	recording of pixel, line and frame pulses, online build-up of images by software			
Image resolution, 64-bit SPCM software, for each module				
No of time channels	64	256	1024	4096
No. of pixels, 1 detector channel	4096 x 4096	2048 x 2048	1024 x 1024	512 x 512
No. of pixels, 16 detector channels	1024 x 1024	512 x 512	256 x 256	128 x 128
Dead Time	100 ns			
Output Data Format (ADC / Macrotime / Routing)	12 / 12 / 4			
FIFO buffer capacity (photons, per TCSPC channel)	2 M			
Macro Timer Resolution, internal clock	25 ns, 12 bit, overflows marked by MTOF entry in data stream			
Macro Timer Resolution, clock from SYNC input	10ns to 100ns, 12 bit, , overflows marked by MTOF entry in data stream			
Curve Control (external Routing)	4 bit TTL			
External event markers	4 bit, TTL			
Count Enable Control	1 bit TTL			
Experiment Trigger	TTL			

Detector control
Number of independently controlled detectors	one or two
Resolution of detector gain control	12 bit
Voltage Range Pin 12 of connector 1 and 3	0 to +10 V
Voltage Range Pin 13 of connector 1 and 3	0 to +0.9 V
Output Time Constant	100 ms
Detector overload shutdown	via TTL signal from detector module or preamplifier
Reset of overload shutdown	By software and at power-on
Shutter control	8 independent high-current switches
Max. Switch Current, Single Switch	2 A
Max. Switch Current, Sum of all Switches	5 A
Max. turn-off Voltage at Switches	20 V
Control of thermoelectric coolers	for one or two detectors
Total output voltage	0 to 5 V
Output Current	0 to 2 A

Related Literature
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BDL-SMN series picosecond diode lasers, user handbook. Available on www.becker-hickl.com
Please see also www.becker-hickl.com, 'Literature', 'Application notes'
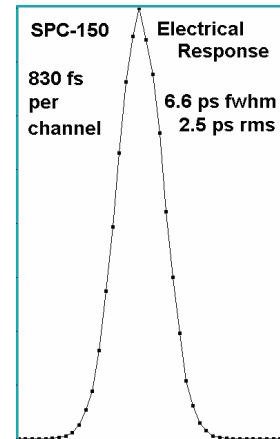
More than 20 years experience in multi-dimensional TCSPC. More than 1500 TCSPC systems worldwide.