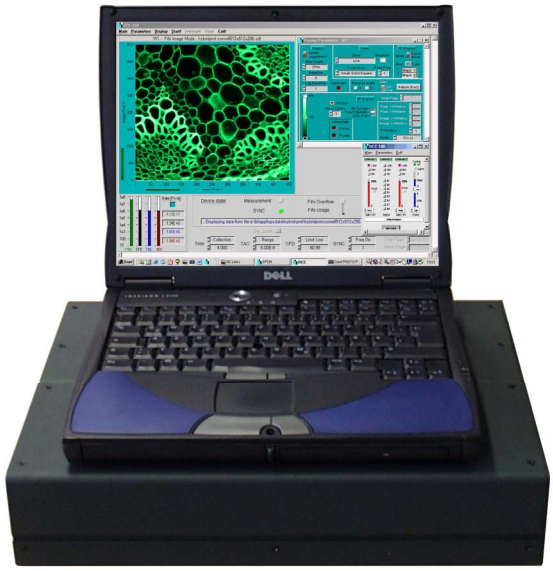
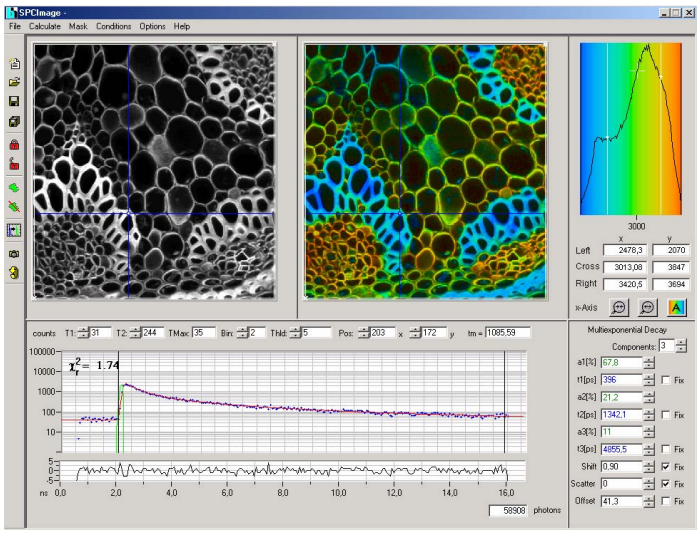
Simple-Tau 150 Table-Top TCSPC Systems

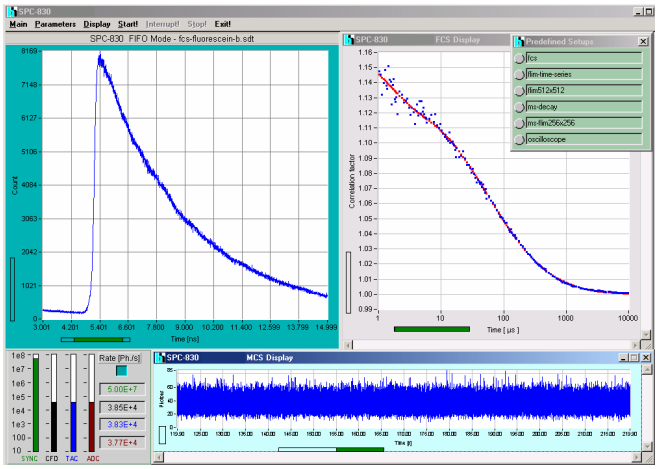
Time-correlated single photon counting systems in lap-top format

Based on bh SPC-150 TCSPC module

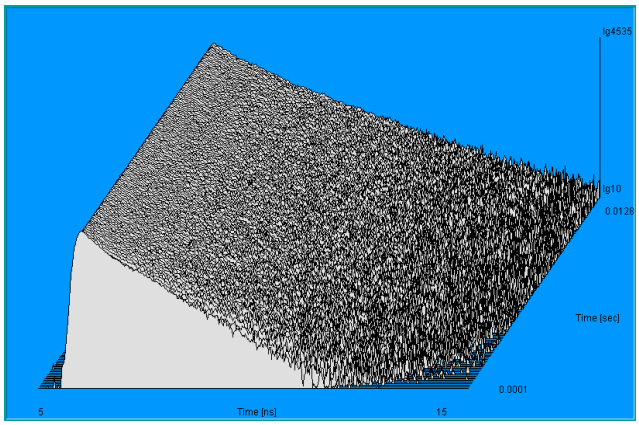
Compact TCSPC systems
Laptop computer with extension box
Coupled via fast bus extension interface
SPC-150 TCSPC module, DCC-100 detector controller
Picosecond time resolution
Time channel width down to 813 fs
Electronic IRF (Jitter) 6.6 ps FWHM, 2.5 ps rms
Unprecedented timing stability
High count rate
Photon distribution and parameter-tag modes
Standard fluorescence decay recording
Fast triggered sequential recording
Unlimited sequential recording by memory swapping
Lifetime imaging in histogram and time-tag modes
FLIM by bh Megapixel Technology
Multi-spectral FLIM
Mosaic FLIM, PLIM, FLITS
FCS, FCCS, single-molecule spectroscopy
64-bit operating software
Windows XP, Windows 7, Windows 8







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



Becker & Hickl GmbH
Technology Leader in TCSPC
Nahmitzer Damm 30
12277 Berlin, Berlin
Tel. +49 / 30 / 787 56 32
Fax. +49 / 30 / 787 57 34
email: info@becker-hickl.com
www.becker-hickl.com

US Representative:
Boston Electronics Corp
tcspc@boselec.com
www.boselec.com

UK Representative:
Photonic Solutions PLC
sales@psplc.com
www.psplc.com

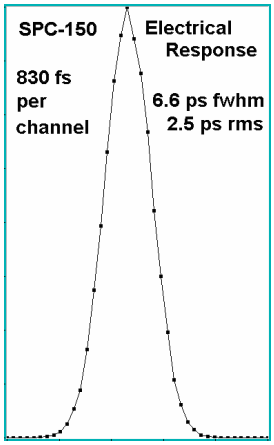
Japan:
Tokyo Instruments Inc.
sales@tokyoinst.co. jp
www.tokyoinst.co.jp

China:
DynaSense Photonics Co. Ltd.
info@dyna-sense.com
www.dyna-sense.com

Simple-Tau 150 Table-Top TCSPC Systems

Photon Channel

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



Synchronisation Channel

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

Data Acquisition (Histogram Mode)

Method	on-board multi-dimensional histogramming process						
Dead Time	100ns, independent of computer speed						
Saturated count rate / count rate at 50% loss	10 MHz / 5 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 100,000 s						
Display Interval Time	0.1 us to 100,000 s						
Repeat Time	0.1 us to 100,000 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 / Parameter-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 parameter-tag mode	recording of pixel, line and frame pulses, online build-up of images by software			
Image resolution, 64-bit SPCM software				
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)	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 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

W. Becker, Advanced time-correlated single photon counting techniques. Springer 2005. Please contact bh for availability.
W. Becker, The bh TCSPC Handbook, 6th edition. Available on www.becker-hickl.com
PML-16-C 16 channel detector head for time-correlated single photon counting. User handbook. Available on www.becker-hickl.com
DCS-120 Confocal Scanning FLIM Systems, handbook. Available on www.becker-hickl.com
Modular FLIM systems for Zeiss LSM 510 and LSM 710 / 780 / 880 laser scanning microscopes, user handbook. Available on www.becker-hickl.com
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.