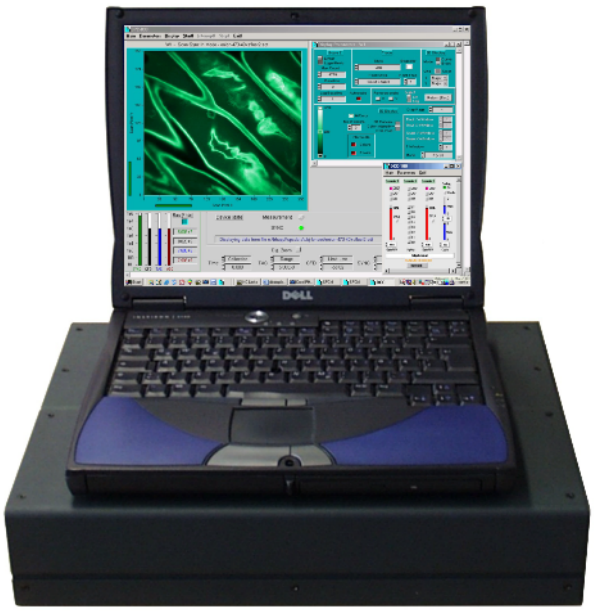
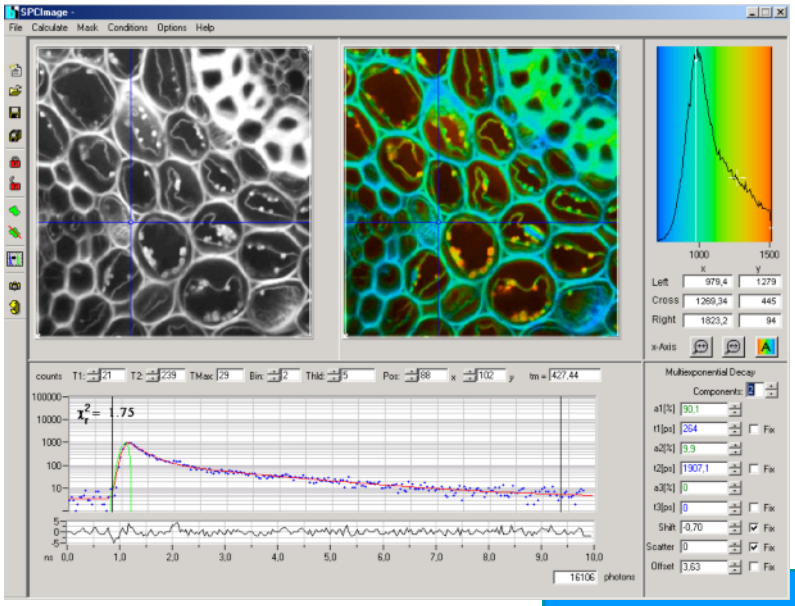
Simple-Tau 830 Table-Top TCSPC Systems

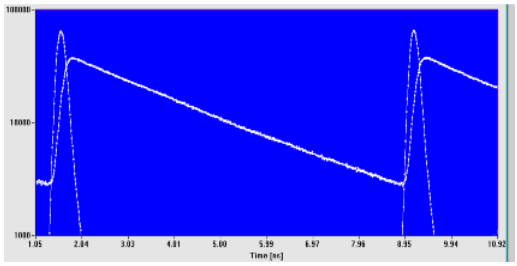
Ultra-fast time-correlated single photon counting systems in lap-top format

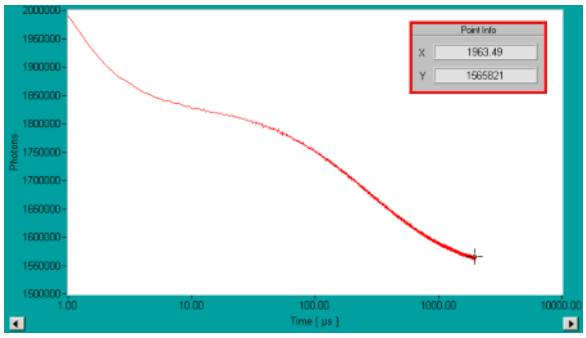


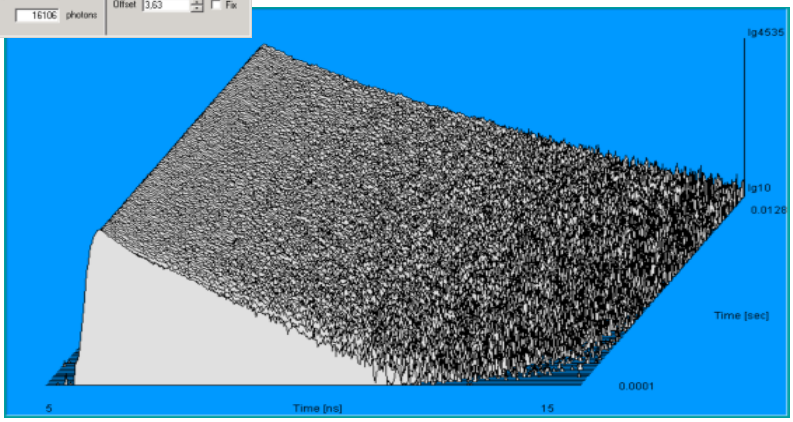
Based on bh SPC-830 TCSPC module

Compact TCSPC system
Laptop computer with extension box
Coupled via fast bus extension interface
SPC-830 TCSPC module, detector, detector controller
Picosecond resolution
Time channel width down to 813 fs
Electronic IRF 7 ps FWHM
High count rate
Unprecedented timing stability
Photon distribution and time-tag modes
Standard fluorescence decay recording
Fast triggered sequential recording
Lifetime imaging in histogram and time-tag modes
Multi-spectral FLIM
FCS recording
Works under windows 2000, NT, XP, Vista, 7









Becker & Hickl GmbH
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

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

Simple-Tau 830 Table-Top TCSPC Systems

Photon Channel

Principle	Constant Fraction Discriminator (CFD)
Time Resolution (FWHM / RMS, electr.)	7 ps / 4 ps
Opt. Input Voltage Range	- 50 mV to - 1 V
Min. Input Pulse Width	400 ps
Threshold	- 20 mV to - 500 mV
Zero Cross Adjust	- 100 mV to + 100 mV

Synchronisation Channel

Principle	Constant Fraction Discriminator (CFD)
Opt. Input Voltage Range	- 50 mV to - 1 V
Min. Input Pulse Width	400 ps
Threshold	- 20 mV to -500 mV
Frequency Range	0 to 200 MHz
Frequency Divider	1-2-4-8
Zero Cross Adjust	-100 mV to + 100 mV

Time-to-Amplitude Converters / ADC

Principle	Ramp Generator / Biased Amplifier
TAC Range	50 ns to 2 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 2 us
min. Time / Channel	813 fs
TAC Window Discriminator	Any window inside TAC range
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	125ns, independent of computer speed						
Saturated Count Rate, per TCSPC channel / total	8 MHz						
Useful count rate, per TCSPC channel / total	4 MHz						
Number of Time Channels / Pixel	1	4	16	64	256	1024	4096
Image Resolution (pixels), 1 Detector Channel	4096 x 4096	2048 x 2048	1024 x 1024	512 x 512	256 x 256	128 x 128	64 x 64
Image Resolution (pixels), 4 Detector Channels	2048 x 2048	1024 x 1024	512 x 512	256 x 256	128 x 128	64 x 64	32 x 32
Image Resolution (pixels), 16 Detector Channels	1024 x 1024	512 x 512	256 x 256	128 x 128	64 x 64	32 x 32	16 x 16
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						
Synchronisation with scanning	pixel, line and frame clocks from scanning microscope						
Count Enable Control	1 bit TTL						
Experiment Trigger	TTL						

Data Acquisition (FIFO / Time-Tag Modes)

Method	Time-tagging of individual photons and continuous writing to disk
Online Display	Decay function, FCS, Cross-FCS, PCH, MCS traces, images
Dead Time	125 ns
Output Data Format (ADC / Macrotime / Routing)	12 / 12 / 3
FIFO buffer Capacity (photons)	8 M
Macro Timer Resolution, internal clock	50ns, 12 bit
Macro Timer Resolution, clock from SYNC input	10ns to 100ns, 12 bit
Curve Control (external Routing)	3 bit TTL
Count Enable Control	1 bit TTL
Waveform recording	online from time-tag data, up to 16 detector channels
No of counts per time channel	unlimited
Image Acquisition in time-tag mode	recording of pixel, lineand frame pulses, online build-up of images by software
FCS calculation	Multi-tau algorithm, online calculation and online fit

Detector control

Number of idependently controlled detctors	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 PMC-100 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

Detectors, see individual data sheets

Standard detector	PMC-100-1 cooled PMT module
Optional	PMC-100-20 cooled NIR PMT module
Optional	HPM-100-40 and -50 GaAsP and GaAs hybrid detectors
Optional	R3809U MCP PMT with FuG HCN3500-14 power supply and HFA26-01 preamlifier
Optional	id100-20 and id100-50 single-photon APD modules
Optional	PML-SPEC multi-wavelength detector

Related Products and Accessories

SPC-130, SPC-150, DPC-230 TCSPC boards, Simple-Tau 130, 150, 152, 154 systems, FLIM systems, MCPs, PMT modules, SPAD modules, multi-spectral detector assemlies, routing devices for multichannel TCSPC, preamplifiers, PIN and avalanche photodiode modules, ps diode lasers.

Related Literature

W. Becker, Advanced time-correlated single photon counting techniques. Springer 2005. Please contact bh for availability.
W. Becker, The bh TCSPC Handbook, 3rd edition. 466 pages, 503 references. 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 laser scanning microscopes, handbook. Available on www.becker-hickl.com
BDL-375-SMC, BDL-405-SPC, BDL-440-SMC, BDL-473-SMC NUV and blue picosecond diode lasers, handbook. Available on www.becker-hickl.com
Please see also www.becker-hickl.com, 'Literature', 'Application notes'

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