



SPC-QC-004 TCSPC / Time-Tagger Module

3 / 4 Channel Time-Correlated Single Photon Counting Module

Three parallel TCSPC / FLIM channels plus
one synchronisation / reference channel

or

Four absolute-timing channels

Ultra-high discriminator bandwidth

Excellent timing stability

Low dead time

High peak count rate

Recording of optical waveforms

Excitation-multiplexed recording

Multi-wavelength recording

Photon time and parameter tagging

Fluorescence decay measurement

LIDAR

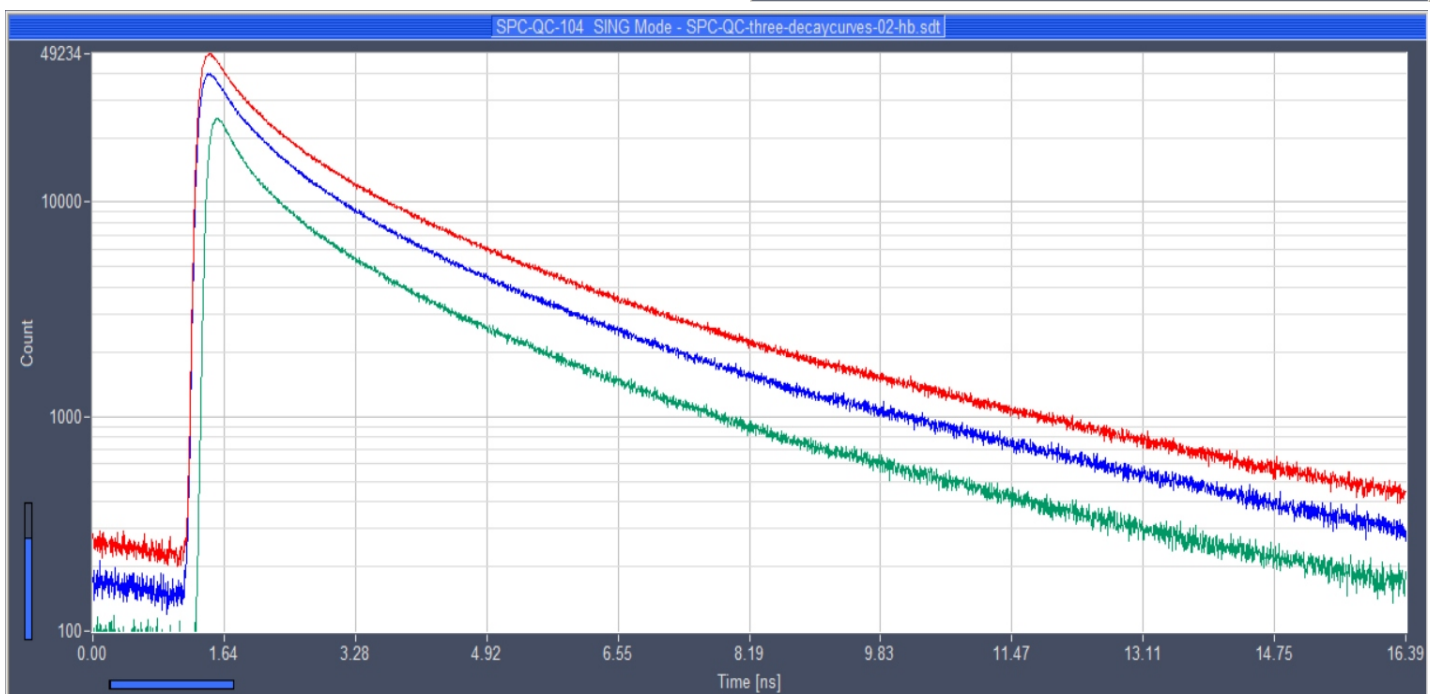
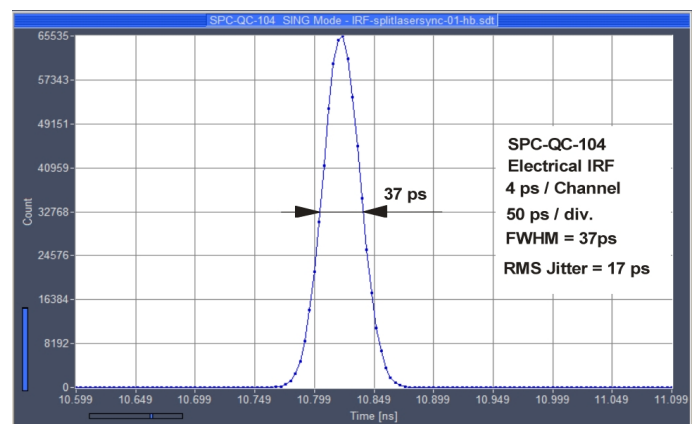
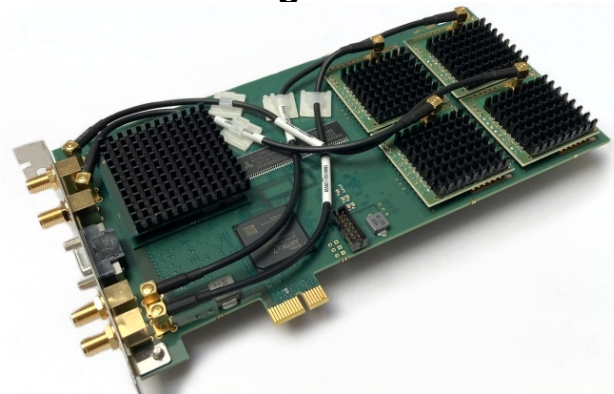
Anti-bunching experiments

Coincidence experiments

fNIRS and NIRS experiments

Single-molecule spectroscopy

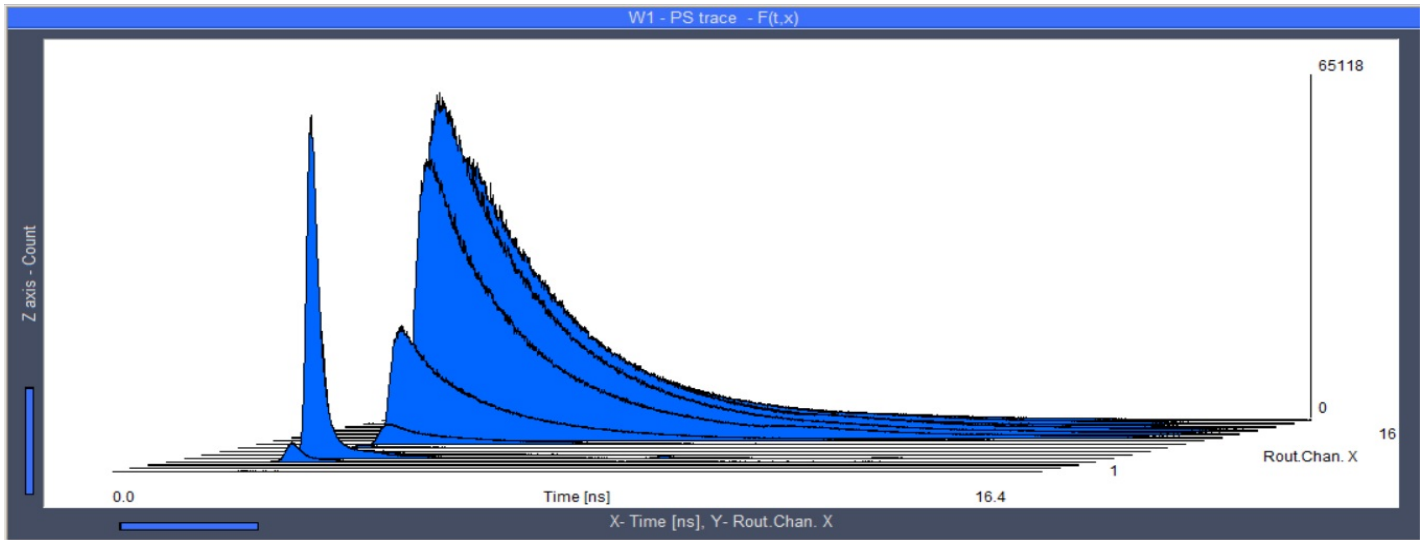
Fluorescence correlation



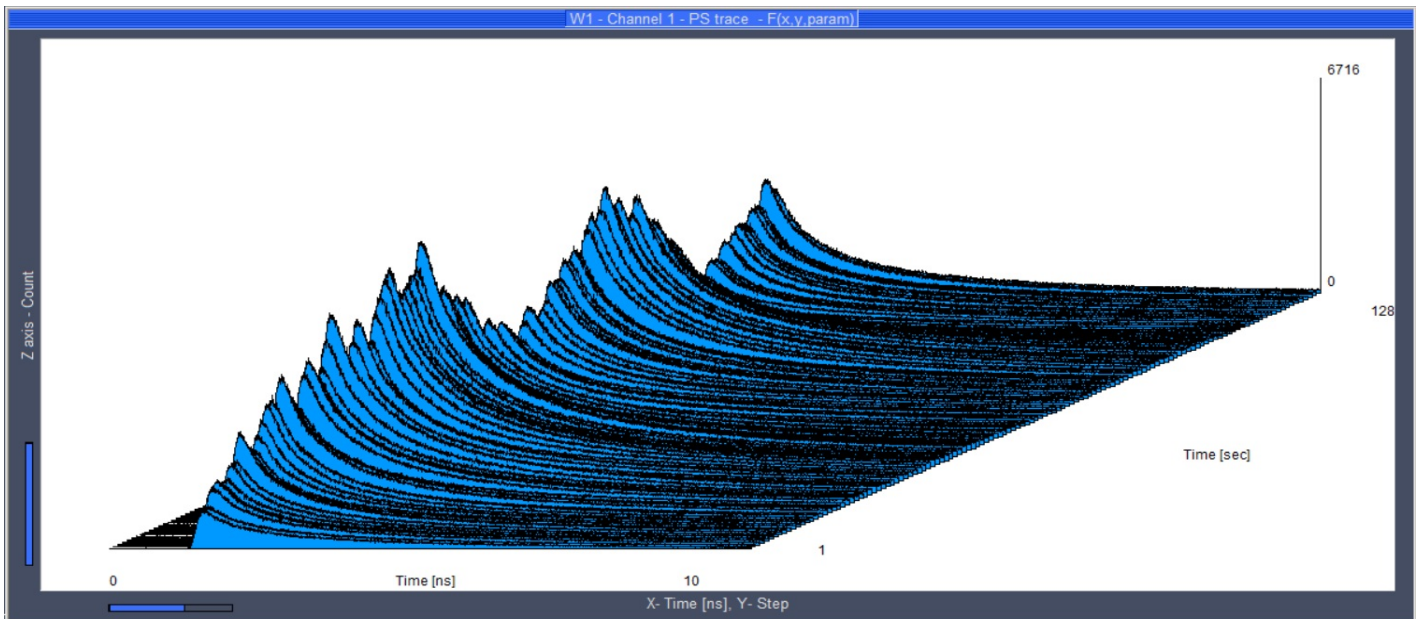
Becker & Hickl GmbH
Nunsdorfer Ring 7-9
12277 Berlin, Germany
Tel. +49 30 212 80 02-0
Fax. +49 30 212 80 02-13
email: info@becker-hickl.com
<https://www.becker-hickl.com>



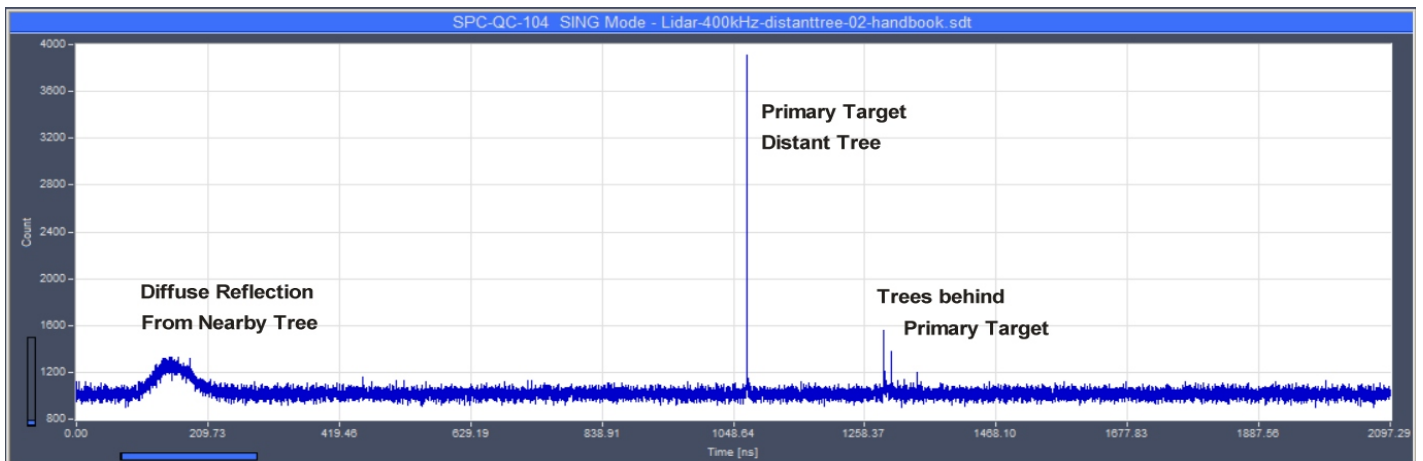
SPC-QC-004 TCSPC / Time-Tagger Module



Fluorescence Decay, Multi-Wavelength Dection



Fluorescence Decay, Time-Series Recording

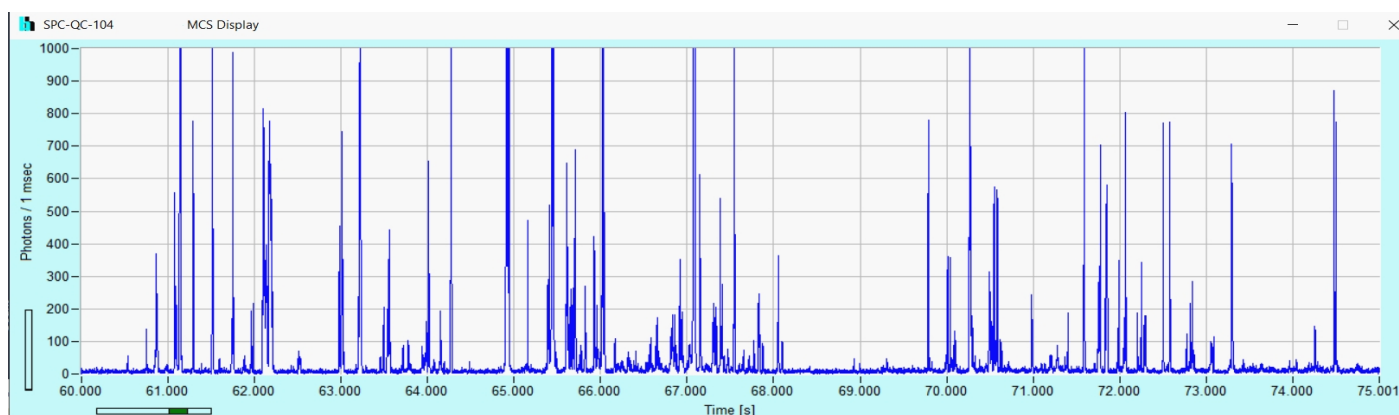


LIDAR

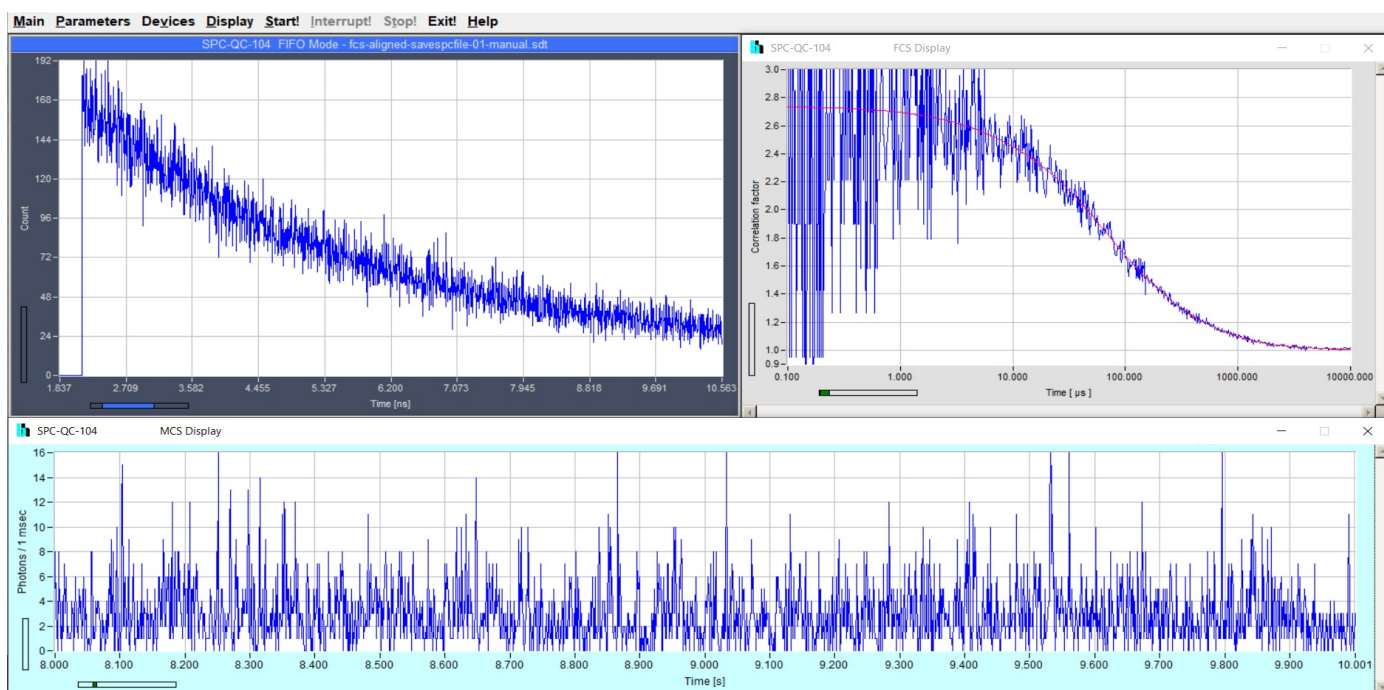


SPC-QC-104

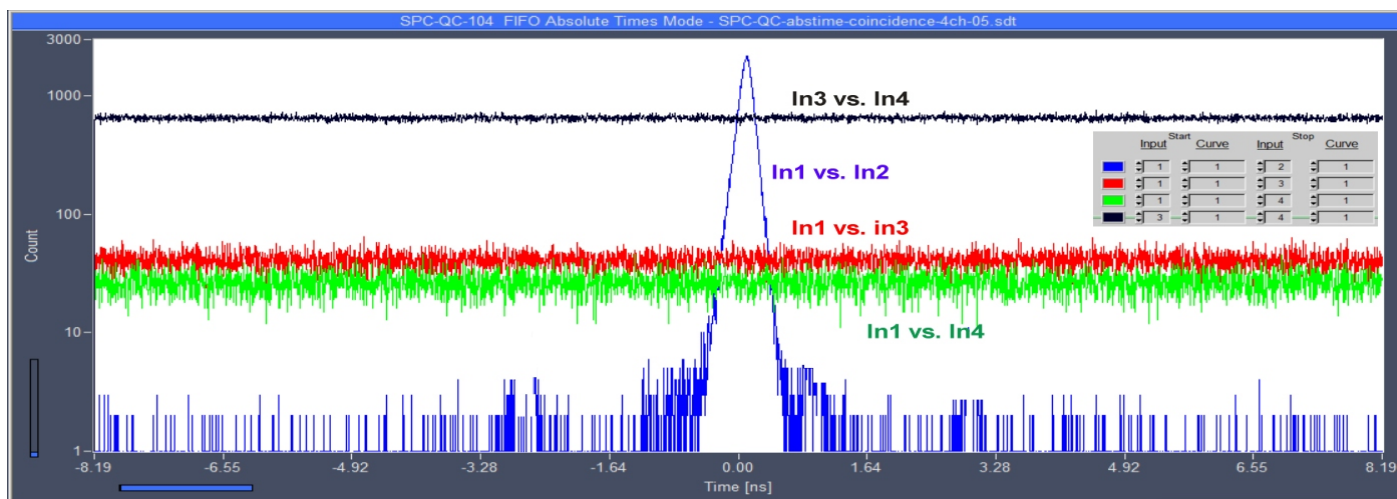
TCSPC / FLIM Module



Fluorescent Particles, diffusion through Laser Focus



Fluorescence Decay / Fluorescence Correlation Measurement



Coincidence Measurement



SPC-QC-104

TCSPC / FLIM Module

Photon Channels

No. of channels
Principle
Discriminator Input Bandwidth
Optimum Input Voltage Range
Min. Input Pulse Width
Threshold
Zero Cross Adjust

3 or 4
Constant Fraction Discriminator (CFD)
4 GHz
- 30 mV to - 500 mV
200 ps
0 to - 250 mV
- 100 mV to + 100 mV

Synchronisation Channel / Fourth Photon Channel

Principle
Discriminator Input Bandwidth
Optimal Input Voltage Range
Min. Input Pulse Width
Threshold
Zero Cross Adjust
Frequency Range
SYNC Frequency Divider

Constant Fraction Discriminator (CFD)
4 GHz
- 30 mV to - 500 mV
200 ps
0 to - 250 mV
-100 mV to + 100 mV
0 to 120 MHz
1 - 2 - 4

Time-Measurement Circuitry

Principle
IRF Width, FWHM
RMS Timing Jitter
Time Range, at 4096 time channels
Min. Time / Channel
Timing stability, range 16 ns, over 10 minutes
Diff. Nonlinearity
Dead Time

Time-to-Digital Converter
< 39 ps, FWHM
< 18 ps, RMS
16 ns to 68 us
4 ps
< 5 ps RMS
< 1 % RMS
8 ns

Data Acquisition (Histogram Modes)

Method
Peak Count Rate, each channel
Saturated count rate, continuous
Max. Counts / Time Channel (Counting Depth)
Max. No. of Time Channels
Overflow Control
Collection Time
Display Interval Time
Repeat Time
Synchronisation with Scanning (Imaging Mode)
Routing
Count Enable
Experiment Trigger

on-board multi-dimensional hardware histogramming process
120 MHz
40 MHz
 $2^{16}-1$
65,536
none / stop / repeat and correct
0.1 us to 100,000 s
10 ms to 100,000 s
0.1 us to 100,000 s
pixel, line and frame clocks from scanning device
4 bit TTL
1 bit TTL
TTL

Data Acquisition (FIFO / Parameter-Tag and Absolute-Time Mode)

Method
Online Display
FCS Calculation
Number of Counts of Decay / Waveform Recording
Peak Count Rate
Sustained Count Rate (Bus-Transfer Limited)
Max. Counts / Time Channel (Counting Depth)
Max. No. of Time Channels
On-board FIFO Buffer Capacity (Photons, per Channel)
Macro Timer Resolution, Internal Clock
Routing
External Event Markers
Experiment Trigger

Parameter-tagging of individual photons, continuous writing to disk
Decay function, FCS, Cross-FCS, PCH, MCS traces
Multi-tau algorithm, online calculation and online fit
unlimited
120 MHz
10 MHz
unlimited
4096
750,000
2 ns, overflows marked by MTOF entry in data stream
4 bit, TTL/CMOS
4 bit, TTL/CMOS
TTL/CMOS

Operation Environment

Operating System
Bus Connector (Slot type)
Total Power Consumption
Dimensions

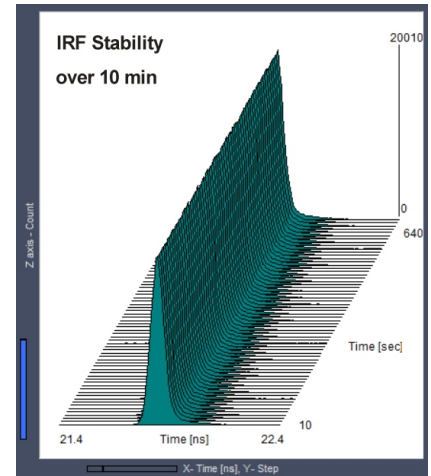
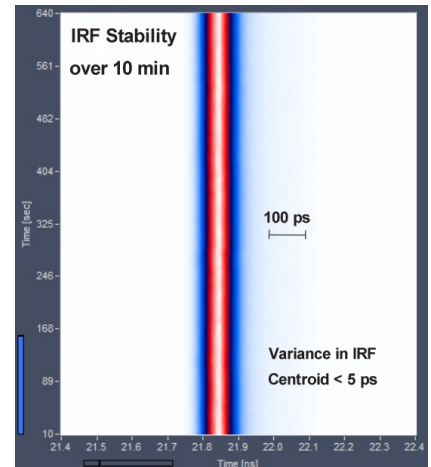
Windows 10, Windows 11
PCI-ex
approx. 12 W from +12V
205 mm x 110 mm x 15 mm

Related Products

SPC-QC-104 three/four-channel TCSPC / FLIM module, SPC-180N, SPC-180NX, SPC-180NXX TCSPC modules, HPM-100 hybrid detectors, DCC-100PCIe detector controller
BDS-SM ps diode lasers, BDS-MM picosecond diode lasers, SPCImage NG data analysis software

Related Literature

SPC-QC-104, user manual. 92 pages, available on <https://www.becker-hickl.com>
W. Becker, The bh TCSPC Handbook, 9th edition (2021). 950 pages, available on <https://www.becker-hickl.com>. Please contact bh for printed copies.
The bh TCSPC Technique, Principles and Applications. Overview brochure, 27 pages, available on <https://www.becker-hickl.com>



International Sales Representatives



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



UK:
Photonic Solutions PLC
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www.psplc.com



Japan:
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sales@tokyoinst.co.jp
www.tokyoinst.co.jp



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