

HPM-100-40

High Speed Hybrid Detector for TCSPC

GaAsP cathode: Excellent detection efficiency

Instrument response function 120 ps FWHM

Clean response, no tails or secondary peaks

No afterpulsing

Excellent dynamic range of fluorescence decay measurement

No afterpulsing peak in FCS measurements

Internal generators for PMT operating voltages

Power supply and control via bh DCC-100 card

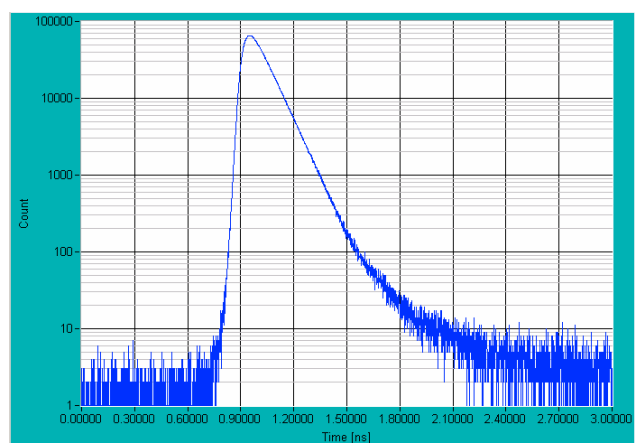
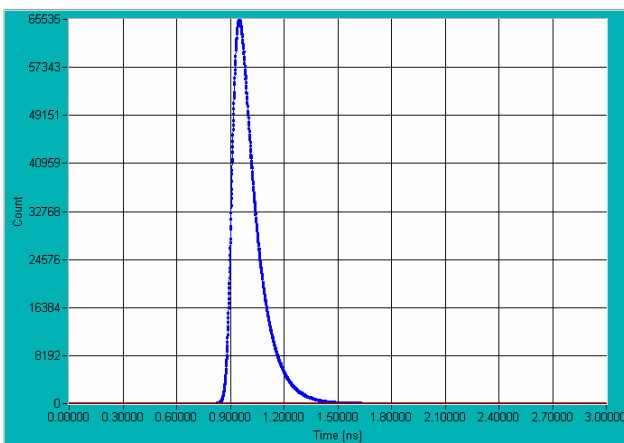
Overload shutdown

Direct interfacing to all bh TCSPC systems

Adapters to bh DCS-120 FLIM system and Zeiss LSM 710 NLO NDD port



The HPM-100 module combines a Hamamatsu R10467-40 GaAsP hybrid PMT tube with the preamplifier and the generators for the PMT operating voltages in one compact housing. The principle of the hybrid PMT in combination with the GaAsP cathode yields excellent timing resolution, a clean TCSPC instrument response function, high detection quantum efficiency, and extremely low afterpulsing probability. The virtual absence of afterpulsing results in a substantially increased dynamic range for fluorescence decay recordings. Moreover, FCS curves obtained with the HPM-100 are free of the typical afterpulsing peak. FCS is thus obtained from a single detector, without the need of cross-correlation. The HPM-100 module is operated via the bh DCC-100 detector controller of the bh TCSPC systems. The DCC-100 provides for power supply, gain control, and overload shutdown. The HPM-100 interfaces directly to all bh SPC or Simple Tau TCSPC systems. It is available with standard C-mount adapters, adapters for the bh DCS-120 confocal scanning FLIM system, and adapters for the NDD ports of the Zeiss LSM 710 NLO multiphoton laser scanning microscopes.



Instrument response function. Left linear scale, right logarithmic scale. FWHM is 120 ps.



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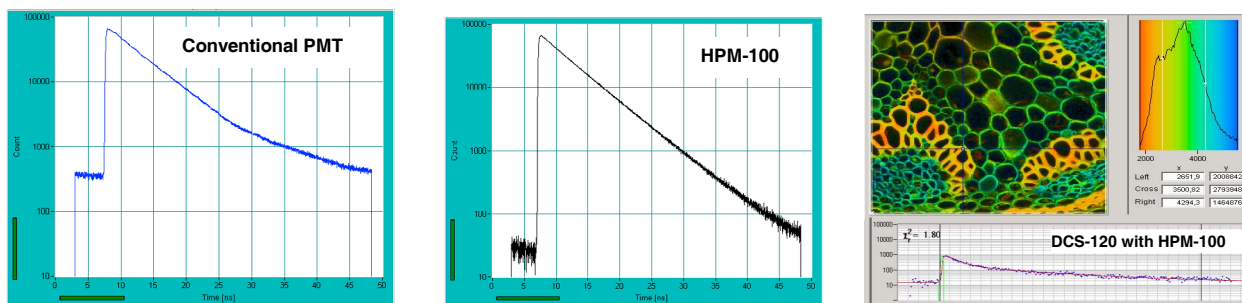
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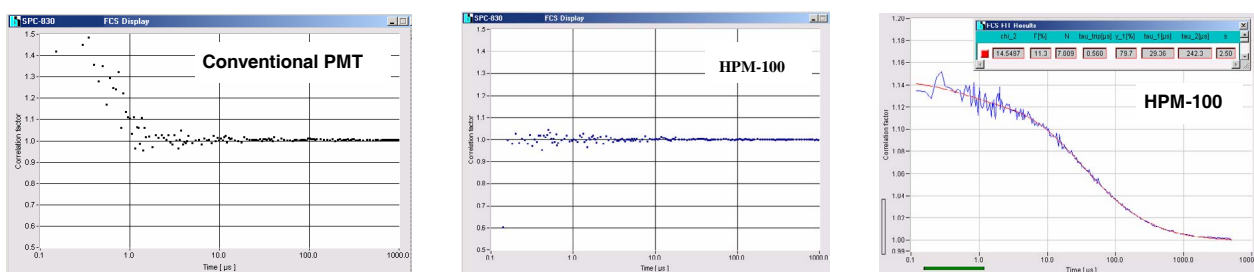
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Absence of afterpulsing improves dynamic range of fluorescence decay measurements



Left: Fluorescence decay recorded with conventional PMT. The background is dominated by afterpulsing. Middle: The only source of background in the HPM is thermal emission of the photocathode. The dynamic range is substantially increased. Right: The lower background yields improved lifetime accuracy and lifetime contrast in FLIM measurements.

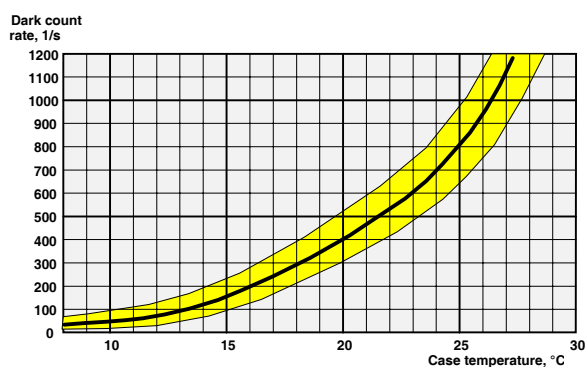
Fluorescence correlation measurements are free of afterpulsing peak



Left: Autocorrelation of continuous light signal of 10 kHz count rate, conventional GaAsP PMT. Middle: Autocorrelation of continuous light signal of 10 kHz count rate, HPM-100 module. The curve is flat down to the dead time of the TCSPC module. Right: FCS curve of fluorescein solution, HPM-100 module. The red curve is a fit with one triplet time and one diffusion time. bh DCS-120 confocal FLIM system, laser 473 nm.

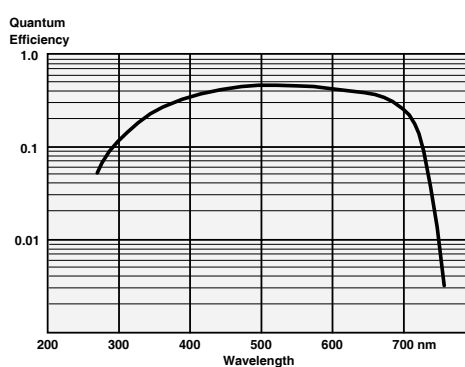
Dark count rate vs. temperature

Typical values and range of variation



Detection quantum efficiency vs. wavelength

APD voltage 95% of maximum



Specifications, typical values

Wavelength Range	300 nm to 730 nm
Detector Quantum efficiency, at 500 nm	45%
Dark Count rate, $T_{case} = 22^{\circ}C$	$560 s^{-1}$
Cathode Diameter	3 mm
TCSPC IRF width (Transit Time Spread)	120 ps, FWHM
Single Electron Response Width	850 ps, FWHM
Single Electron Response Amplitude	50 mV, V_{apd} 95% of V_{max}
Output Polarity	negative
Output Impedance	50 Ω
Max. Count Rate (Continuous)	> 10 MHz
Overload shutdown at	>15 MHz
Detector Signal Output Connector	SMA
Power Supply (from DCC-100 Card)	+ 12 V, +5 V, -12V
Dimensions (width x height x depth)	60 mm x 90 mm x 170 mm
Optical Adapters	C-Mount, DCS-120, LSM 710 NDD port