PMA Hybrid Series

Hybrid Photomultiplier Detector Assembly

- Detection efficiency up to 45 % at 500 nm (cathode dependent)
- Timing resolution down to 20 ps (FWHM, cathode dependent)
  negligible afterpulsing
- Internal HV power supply and pre-amplifier
- Active temperature stabilization
- Shutter and overload protection
- Active sensor area: 3, 5 or 6 mm (cathode dependent)
- Analog output provides positive voltage proportional to count rate

Applications & Methods

- Time-resolved photoluminescence (TRPL)
- Fluorescence lifetime Imaging (FLIM)
- Fluorescence correlation spectroscopy (FCS)
- LiDAR & ranging
- Nanomaterial characterization
- Semiconductor research
- Environmental sensing

The PMA Hybrid is a compact, single photon sensitive detector based on a fast hybrid photomultiplier tube (R10467 from Hamamatsu) with Peltier cooler to reduce the dark count rate. It features two signal outputs: a negative voltage pulse for timing and counting applications and an analog positive output voltage proportional to the count rate that can be connected to e.g. A/D converters. The detector includes a high voltage power supply, a pre-amplifier with overload protection, and an emergency shut down procedure if the detector count rate reaches a critical limit. Overload protection, high voltage set-up, and temperature regulation are calibrated at PicoQuant and do not require any user adjustment. The detector‘s CAN interface is compatible with all PicoQuant systems.

Five different photocathodes can be incorporated into the PMA Hybrid to meet the user’s needs. The PMA Hybrid 06 and 07 are sensitive in the UV and in the blue spectral region. High detection efficiencies in the visible spectrum (up to 45 % at 500 nm) are achieved with the PMA Hybrid 40. For applications using light at longer wavelengths of the visible spectrum and in the NIR, the PMA Hybrid 42 and 50 are the best choices.

The PMA Hybrid is encased in a nickel coated aluminum housing to achieve high level of RF shielding and protection against interference from other devices. The built-in pre-amplifier is specially optimized for timing sensitive applications such as Time-Correlated Single Photon Counting (TCSPC).

All PMA Hybrids have very good timing resolution that can even reach values down to 20 ps (FWHM) for the blue sensitive version. In contrast to other detector types, afterpulsing is negligible. This special feature makes the PMA Hybrid especially suited for e.g., Fluorescence Correlation Spectroscopy (FCS), where the afterpulsing peak at early lag times often complicates the analysis of the autocorrelation function.

The PMA Hybrid interfaces directly with all PicoQuant TCSPC products such as the PicoHarp 330 or HydraHarp 500. Due to its large active area, the detector can be connected to spectrometers like the FluoTime 250 or FluoTime 300 from PicoQuant. It can also be attached to Laser Scanning Microscopes in Non-Descanned Detection (NDD) set-ups via the C-mount adapter. Integration in descanned detection mode or other systems, e.g., the confocal time-resolved microscope

MicroTime 200 from PicoQuant is also possible. The output signal of the PMA Hybrid is accessible through a standard 50 Ohms SMA connector. The module only needs a 12 V DC supply line, which is included in each PMA Hybrid delivery.

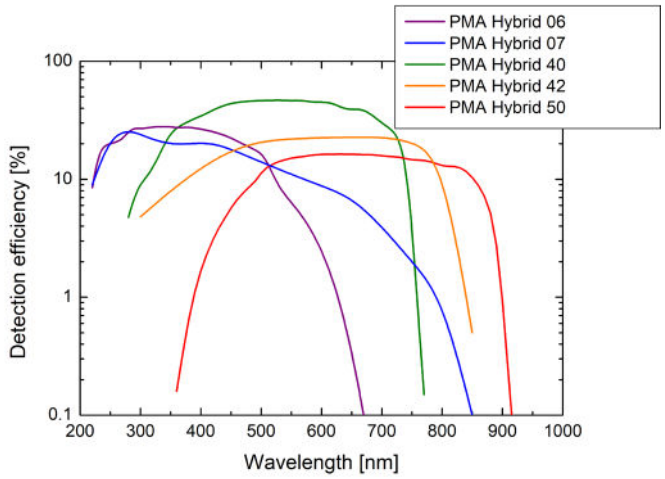
Specifications

Electrical parameters							
Carthode type	**06**	**07 - 3 mm**	**07 - 6 mm**	**40 - 3 mm**	**40 - 5 mm**	**42**	**50**
Wavelength range	220 - 650 nm	220 - 850 nm	300 - 720 nm	300 - 720 nm	300 - 870 nm	380 - 870 nm	380 - 890 nm
Dark counts (cooled)*	typ. 10 cps max 20 cps	typ. 100 cps max 250 cps	typ. 100 cps max 250 cps	typ. 100 cps max 300 cps	typ. 300 cps max 1000 cps	typ. 150 cps max 320 cps	typ. 250 cps max 600 cps
Transit time spread (FWHM, typ. value)	50 ps	20 ps	30 ps	90 ps	170 ps	130 ps	130 ps
General							
Detector area diameter	6 mm	3 mm	6 mm	3 mm	5 mm	3 mm	3 mm

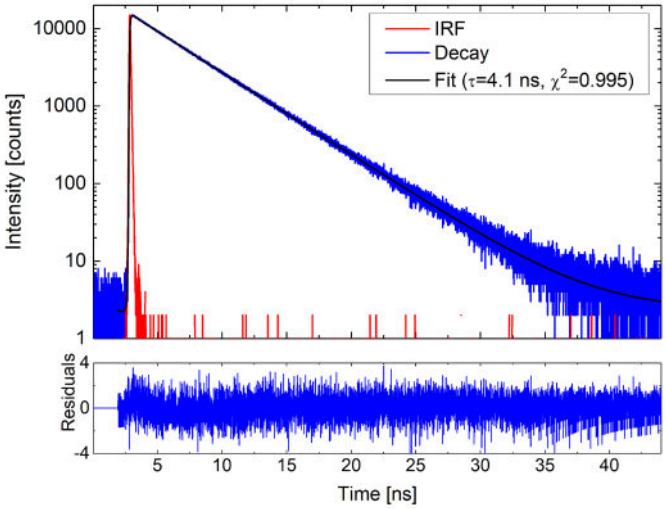
Electrical parameters	
All Types	
Recommended max. count rate	10 MHz
Overload shutdown at	80 MHz (with CW excitation, lower values at different conditions)
Single electron response width (typ. value)	600 ps
Pulse rise / fall time (typ. value)	400 ps
Signal Output (Timing)	
Connector	SMA female
Impedance	50 Ohms
Polarity	negative
Signal Output (Analog)	
Connector	SMA female
Impedance	>1k Ohms
Polarity	positive
Max. Out	+10 V (corresponds to 50 Mcps)
Time constant of the amplifier	20 ps
Power Supply	
Input	12 V DC
Max. current consumption	0.8 A
General	
Housing (w × d × h)	60 mm × 175.3 mm × 114.5 mm
Optical adapters	C-mount, 4 mounting holes

* If lower dark counts than those specified here for the detector of your interest are necessary, we can offer you a special selection upon request.

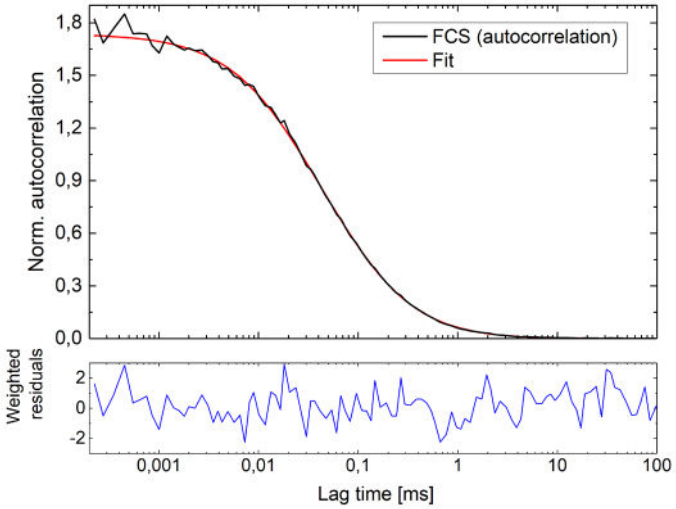
Spectral Response



Measurement Examples



Fluorescence decay of a Anthracen solution in EtOH shows clean response of the detector.



FCS curve (autocorrelation) of a 1 nM ATTO 488 solution. No afterpulsing peak visible.

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