ULTRA FAST PHOTOMULTIPLIERS



Ultra Fast Photomultipliers

FEATURES

- Our photon counting tubes have sharply peaked pulse height distribution and low jitter.
- Our tubes are well matched via SMA or N-Type connectors to 50 Ohm systems
- All tubes are gateable
- 10 mm to 40 mm diameter

APPLICATIONS

- Single photon counting fluorescence
- Lidar
- Time correlated photon counting
- Nuclear Physics
- Analysis of fast optical pulses

THE PMT FAMILY

Photek offers a range of ultra-fast MCP Photomultiplier detectors for the scientific community. Each detector is customised and may be supplied with a choice of input window, photocathode, MCP configuration, pulse rise time and gating options.

The current PMT family includes the following detectors:

PMT X10	PMT X13	PMT X18
PMT X25	PMT X40	

Where X defines the MCP configuration and may be 0, 1, 2 or 3 gain stages and the number following this corresponds to the active diameter of the detector. For example a PMT213 is a two stage 13 mm detector.

Each MCP gain stage broadens the electron pulse time spread as well as increasing the gain. Small pore MCPs have faster time response than standard MCPs. Our PMT X10 and PMT X13 use small pore MCPs and have the fastest time response in our product range. Time response is improved in small detectors, because of reduced capacitance and hence smaller CR time constant.

All tubes have metal-ceramic construction, with remotely processed cathodes to minimise noise and maximise QE at the customers chosen wavelength. All tubes use a mesh to electrically screen the anode and improve the rise time.

Gain
The gain of the detector is dependant on the MCP configuration.

Input Windows
These ultra-fast detectors may be supplied with the following input windows:

- MgF_2
- LiF_2
- Fused Silica
- Glass
- BaF_2
- YAP:Ce
- Be
- Fibre Optic **

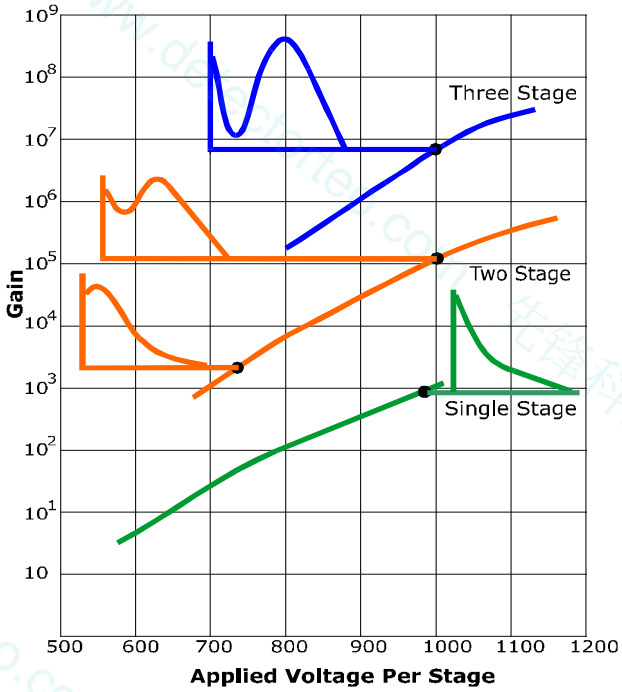
** This will degrade the response time due to variations in optical path length variation for individual photons.

Gating
All of the MCP photo multiplier tubes may be configured so the cathode can be gated to allow synchronous gating of, for example, laser pulses and consequent suppression of dark noise and scattered light.

Typical on-times of 50-100 ns in conjunction with repetition rates of a few KHz gives a noise suppression ratio of about 1000:1

For photomultipliers fitted with this option a gating pulse may be ac coupled into the divider chain for switching of the photocathode. The gating circuitry may be set to pulse the cathode on or off.

Pulse Height Distribution
The diagram below shows typical pulse height distributions obtained from different MCP configurations.



	PMT013	PMT113	PMT125	PMT140
Anode Size (mm)	13 mm	13 mm	25 mm	40 mm
Electron Gain	None	2000	10^3	10^3
Dynamic Range	10^6:1	1,000:1	1,000:1	1,000:1
Pulse Rise Time	50 ps	95 ps	250 ps	250 ps
Pulse FWHM	75 ps	140 ps	500 ps	500 ps
MCP Pore Size	None	5/6	5/6	10/12

	PMT210	PMT212	PMT325	PMT340
Anode Size	10 mm	12 mm	25 mm	40 mm
Electron Gain	10^6	10^6	10^7	10^7
Peak/Valley	2:1	1.5:1	2:1	2:1
Dynamic Range cps	40,000	40,000	40,000	40,000
Pulse Rise Time	100 ps	100 ps	300 ps	500 ps
Pulse FWHM	170 ps	170 ps	800ps-1 ns	1 ns
Transit Time Jitter	30 ps	30 ps	100 ps	100 ps
MCP Pore Size	5/6	5/6	10/12	10/12

Pulse Rise Time
The pulse rise time and FWHM of the detectors may be adjusted by a factor of up to 4:1 by varying the anode bias voltage. This allows the detector to be more easily matched to a range of amplifiers. Please specify the required rise time / discriminator when ordering.

Dynamic Range
Diode types such as the PMT 012 have reported linear dynamic range of 6 orders of magnitude. Microchannel plates are not linear devices. However, at low pulse repetition rates, users report linear performance from 50 mV up to 25 Volts into a 50 ohm load.

Pre-amplifiers and Gate Control Units
Photek can also supply 2 GHz bandwidth preamplifiers, gating power supplies capable of 100 kHz operation and gating control units

Constant Fraction Discriminators

Photek is able to offer a constant fraction discriminator.

Power Supplies
Operating voltage is dependent on MCP configuration and the MCP output bias voltage and is normally in the range -2 kV to -5 kV. It is highly recommended that the voltage is gradually increased or decreased when the unit is switched on/off.

Photek recommend the BPSU1N-5 kV which is an adjustable unit with a maximum output of -5 kV and provides the necessary dv/dt control when switching the unit on or off.

Type	Diameter	Length
PMT X10	63.9	51
PMT X13	63.9	51
PMT X25	63.9	60
PMT X40	90	64

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