

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 connectors to 50 Ohm systems
- ❑ All tubes are gateable
- ❑ 9mm to 40mm diameter

APPLICATIONS

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

THE PMT FAMILY

Photek offer a range of ultra-fast MCP Photomultiplier detectors for the scientific community. Each detector is customisable 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 X09 PMT X25
PMT X13 PMT X40

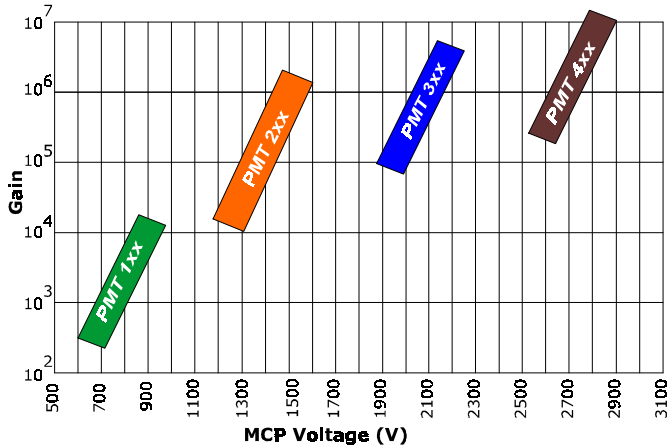
Where X defines the MCP configuration and may be 0, 1, 2, 3 or 4 gain stages and the number following this corresponds to the active diameter of the detector. For example a PMT209 is a two stage 9mm detector.

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 MCP X09 uses small pore MCPs and has the fastest time response in our product range. Time response is improved in small detectors, because of reduced capacitance, hence smaller CR time constant.

All tubes are 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. The graph below shows typical gain vs. voltage



Input Windows

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

- MgF2
- Fused Silica
- Glass
- Fibre Optic **

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

Gating

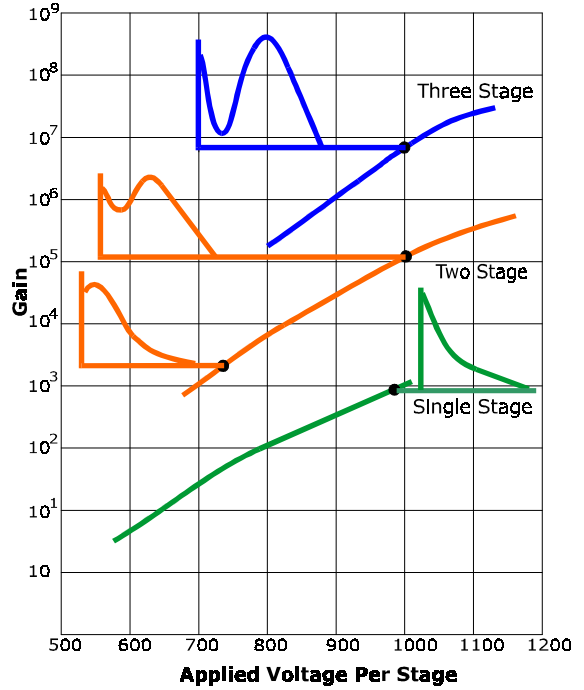
All of the MCP photo multiplier tubes may be configured so the cathode may be gated to allow synchronous gating of for example laser pulses and consequent suppression of dark noise and scattered light.

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



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 013 have reported linear dynamic range of 6 orders of magnitude. Micro channel plates are not linear devices. However, at low pulse repetition rates, users report linear performance from 50mV up to 25 Volts into a 50 ohm load.

Pre-amplifiers and Gate Control Units

Photek can also supply 2GHz bandwidth preamplifiers, gating power supplies capable of 100kHz operation and gating control units

Power Supplies

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

Photek recommend the BPSU1N-5KV which is an adjustable unit with a maximum output of -5KV and provides the

Type	Diameter	Length
PMT X09	63.9	51
PMT X12	63.9	51
PMT X18	63.9	51
PMT X25	63.9	60
PMT X40	90	64

	PMT109	PMT013	PMT113	PMT213	PMT125	PMT140
Active Size	9mm	13mm	13mm	13mm	25mm	40mm
Electron Gain	2,000	None	10 ³	5x10 ⁵	10 ³	10 ³
Dynamic Range	1,000:1	10 ⁶ :1	1,000:1	1,000:1	1,000:1	1,000:1
Pulse Rise Time	70ps	50ps	70ps	100ps	250ps	250ps
Pulse FWHM	120ps	75ps	180ps	250ps	500ps	500ps
MCP Config	60:1 5/6	None		40:1 10/12		

	PMT209	PMT413	PMT325	PMT340
Active Size	9mm	13mm	25mm	40mm
Electron Gain	10 ⁶	10 ⁷	10 ⁷	10 ⁷
Peak/Valley Ratio	1.5:1	3:1	2:1	2:1
Dynamic Range	40,000 cps	40,000cps	40,000 cps	40,000cps
Pulse Rise Time	100ps		250-500ps	500ps
Pulse FWHM	170ps		500ps-1ns	1ns
Transit Time Jitter	30ps	80ps	100ps	100ps
MCP Configuration	60:1 5/6		40:1 10/12	

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