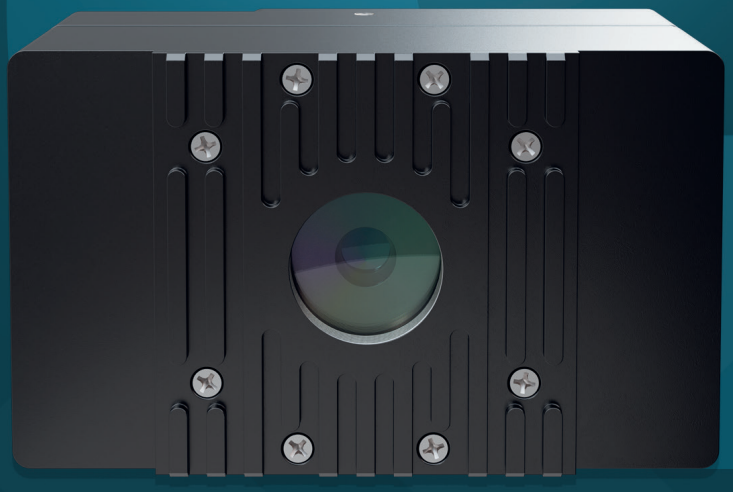
ULTRA-HIGH RATE
ULTIMATE TIMING ACCURACY

PHOTONIS
EXOSENS GROUP

PhotonPix™

For Single Photon Detection



The PhotonPix™ is the solution for ***ultra-fast*** single photon counting with ultimate timing accuracy. The heart of the detector is a state-of-the-art Photonis Fast Timing MCP-PMT. Combined with a revolutionary read-out electronics (*), the unit enables dead time below 2 ns and count rates up to few 100 MHz, equivalent to photon rates above GHz.

The high throughput detection and the timing resolution below 30 ps FWHM (12 ps σ) makes the PhotonPix™ an ideal photon detector for your application. Its large Ø8 mm sensitive area can accommodate one of our many Hi-QE photocathodes optimized for high Quantum Efficiency and low dark rates.

Plug and Play Single Photon Counting made by Photonis, the global leader in low light imaging and single photon detection.

***In collaboration with** Photonscore.

Key Features

- Excellent Temporal Characteristics
- Large Collection Area
- Hi-QE Photocathode Technology
- Extreme Low Dark Count Rate
- Plug-and-Play Integration

Applications

- TCSPC & FLIM
- Particle Physics
- Quantum Optics & Quantum Information
- Quantum Key Distribution (QKD)
- High-End LiDAR
- Plasma Research

Contact us for expert advice on your application

PhotonPix™ Overview

The PhotonPix™ demonstrates excellent temporal characteristics, enabling time resolutions of <30 ps (FWHM) or 13 ps (σ). The quantum efficiency exceeds 30% over a broad spectral range, combining extremely low dark rates for the Hi-QE UV, blue, green, and red photocathode series.

The PhotonPix™ integrates a Photonis-made MCP-PMT. It uses optimized MCP technology, which enables excellent Pulse Height Distribution (PHD) and Collection Efficiency (CE) approaching 100%, resulting in Photon detection efficiency (PDE) closely matching the quantum efficiency (QE).

The PhotonPix™ distinguishes itself from an MCP-PMT by integrating all the necessary electronics, including a high-voltage power supply, fast amplifier, and constant fraction discriminator (CFD) that generates an NIM output signal. Furthermore, the detector is cooled by an integrated Peltier element, lowering the dark count rates up to three orders of magnitude compared to room temperature operation. The heat is dissipated by water cooling, enabling the detector to be run in closed or integrated environments. These features enable plug-and-play operation, compatible with nearly every time-tagger that supports NIM signals.

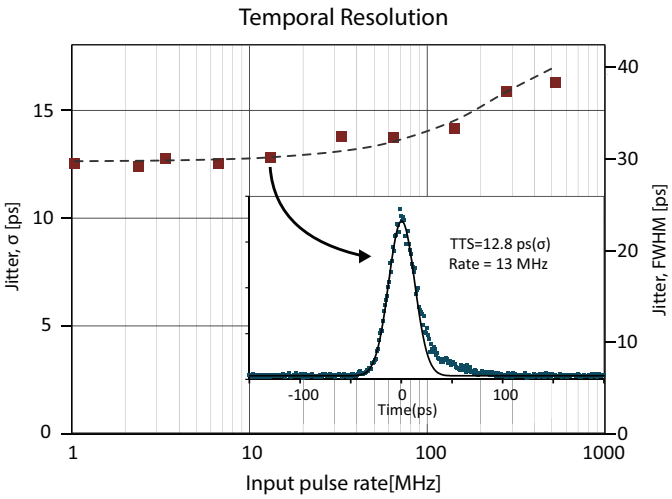


Figure 1: Graph showing excellent temporal resolution as a function of input pulse rate, measured in burst illumination mode operation. Up to 15 MHz the TTS remains below 13 ps, where the pulse counting efficiency is close to 100%. Thanks to the very short deadtime, detection at 500 MHz is possible (with 50% counting efficiency). Even at this high input pulse rate, the timing accuracy is around 16 ps.

PhotonPix™ Specifications

Cathode Specifications	
Input Window	Quartz, Glass, MgF_2
Photocathode	Hi-QE UV, Blue, Green, Red (other types available upon request)

Detector Specifications	
Max. Recomended Count Rate	100 MHz (continuous count rate) 200 MHz (burst)
Shutdown Count Rate (Continuous)	110 MHz
Dark Count Rate	<15 (UV, Blue), < 50 (Green), <200 (Red)
Timing Jitter (FWHM)	<30 ps (up to 15 MHz) <40 ps (up to 200 MHz)
Active Area (mm)	8 Ø
Dead Time	<2 ns
Discrimination	Integrated CFD

Signal Output	
Output Connector	SMA Female
Output Signal	NIM, 50 Ohm & raw amplifier signal
Polarity	Negative

General	
Power Supply	12 V, 1 A
Optical Interface	C-Mount
Dimensions (w x d x h)	117 mm x 61mm x 70mm
Cooling	Integrated water cooling and external radiator for heat dissipation

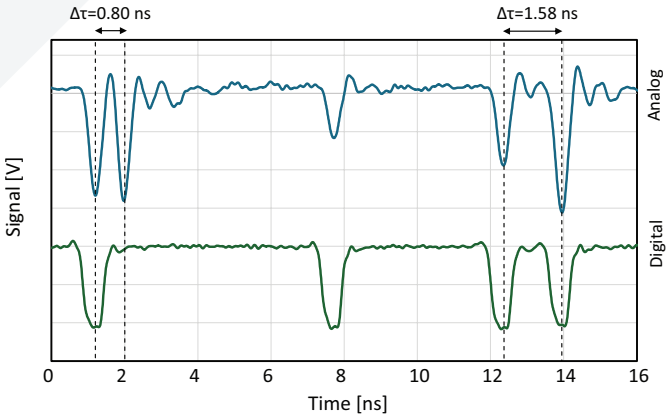
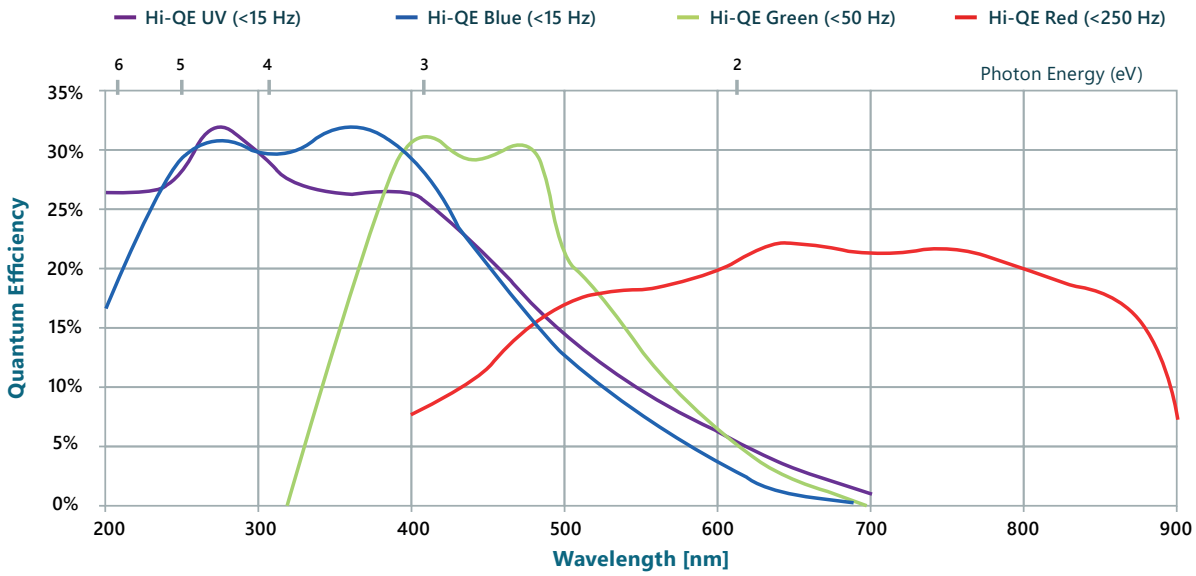


Figure 2: The PhotonPix™ converts the analog signal from the MCP-PMT to a digital NIM signal. This conversion determines the deadtime of the PhotonPix™. In this diagram the ultra short deadtime of under 1.6 ns is demonstrated. For the analog signal the peaks on the left with a time spacing of 0.8 ns only one digital signal is observed. When the time between two incidents photons increases to 1.6 ns, as shown on the right, two distinct signal are observed at the output.

Photocathode Overview



Typical quantum efficiency spectrum of four selected photocathodes, the dark current of each photocathode in shown in between brackets.

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