Redefining Measurement
ID Qube Series: NIR Free-Running version
Asynchronous Single-Photon Detection at Telecom Wavelengths

COMPACT & COST-EFFECTIVE

The ID Qube NIR Free-Running SPAD modules are a breakthrough in single-photon detection especially dedicated to asynchronous detection at telecom wavelength's.

They provide a cost-effective solution for applications in which asynchronous photon detection is essential such as photon correlation or time of flight measurements. Moreover it is especially suited for applications such as LiDAR where compactness is strongly required.

The module also features a gate input port connector dedicated to avoid saturation or undesired detections during a predefined period of time. As opposed to the ID Qube NIR Gated version, the gating capabilities are limited to microsecond range gates, whereas the gated version is designed to offer gate in the nanoseconds range. The cooled InGaAs/InP avalanche photodiode and associated electronics have been specially designed to achieve low dark count and afterpulsing rates in free-running mode.

The device is available in free-space or fibre-coupled version (MMF62.5) compatible with both SMF and MMF62.5 fibers. The fiber coupled version is equipped with a reinforced metallic fiber optic cable, which offers robustness and total immunity to ambient light for extremely low light measurements.

Applications

📡	Quantum communication
⚛	Quantum physics and optics
📈	Time of flight measurements (OTDR, LiDAR)
🔬	Fluorescence Lifetime measurements

Key Benefits

€	Compact & cost-effective
🕑	Optimized for free-running operation
⊕	Ultra-low noise (800 cps at 10%)
⏱	Low jitter (150 ps)

ID Qube NIR Free-Running

Free-running mode at telecom wavelengths

The ID Qube has been specially designed to achieve low dark count and afterpulsing rate in free-running mode.

The ID Qube NIR Free-Running can operate at three detection probability levels of 10%, 15% and 20% with user-defined deadtime between 0.1 μs and 80 μs. The arrival time of photons is reflected by a 10 ns LVTTL/NIM (user-selectable) pulse available at the SMA connector with a timing resolution as low as 150 ps at 20% efficiency. A simple USB interface allows the user to set the efficiency level and the deadtime.

EFFICIENCY

The ID Qube response calibration is carefully carried out in-house using equipment's calibrated by the Swiss Institute of Metrology (METAS).
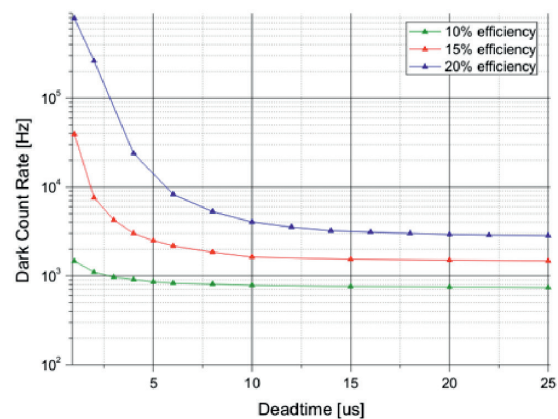

Efficiency versus wavelength
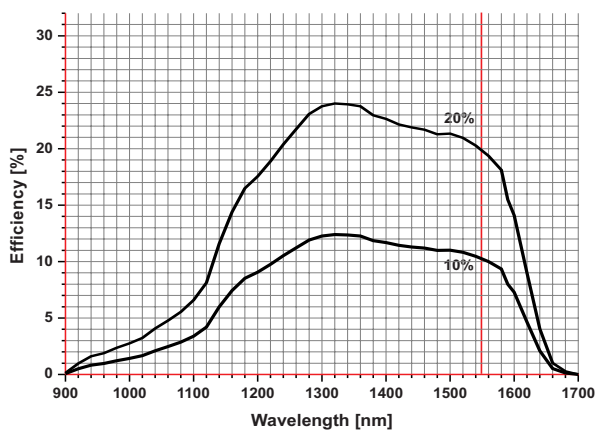
DARK COUNT RATE

The measured dark count rate strongly depends on two settings: efficiency and deadtime. By playing with them, it is possible to optimize efficiency, afterpulsing and dark count rate for each dedicated experiment.
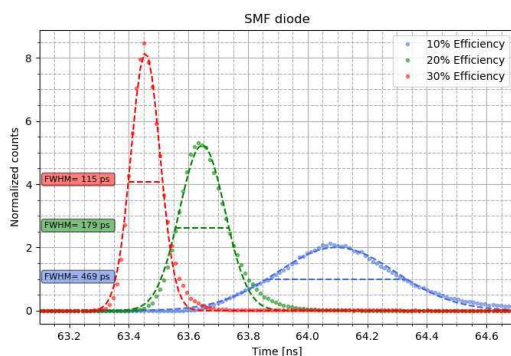

Dark count versus deadtime
(for illustration only)

LOW JITTER

The jitter of a SPAD is greatly reduced when the quantum efficiency is increased as shown on the curve below. The ID Qube NIR Free-Running offers a jitter as small as 150 ps or less at 20% efficiency at 1550 nm. The here below figure shows typical jitter figures. Note that these may vary from diode to diodes.

COMPACT

The ID Qube is small, compact and ideally suited for applications such as LiDAR where compactness is key for system integration.
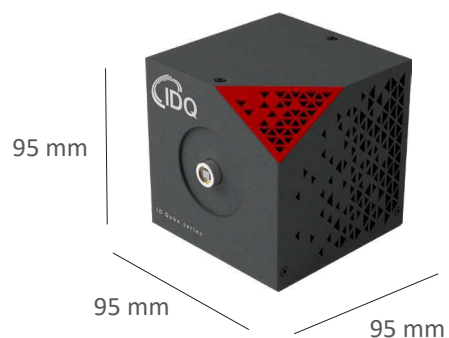
Compact

The ID Qube is especially suited for applications such as Lidar where compactness is key for system integration.

PRINCIPLE OF OPERATION

In contrast with usual gated operations of detectors based on InGaAs/InP avalanche photodiodes (APDs), the ID Qube-NIR-FR operates in free-running (asynchronous) mode. The APD is biased above its breakdown voltage and operated in the so-called Geiger mode. Upon photon absorption, the photon arrival time is reflected by the rising edge of a 10 ns width LVTTL or NIM pulse at the output. The ID Qube NIR Free-Running has been designed to provide a fast avalanche quenching, thus limiting the afterpulsing rate. This allows the operation at reasonably short deadtimes of values that can be optimized depending on the applications and the preset efficiency level.
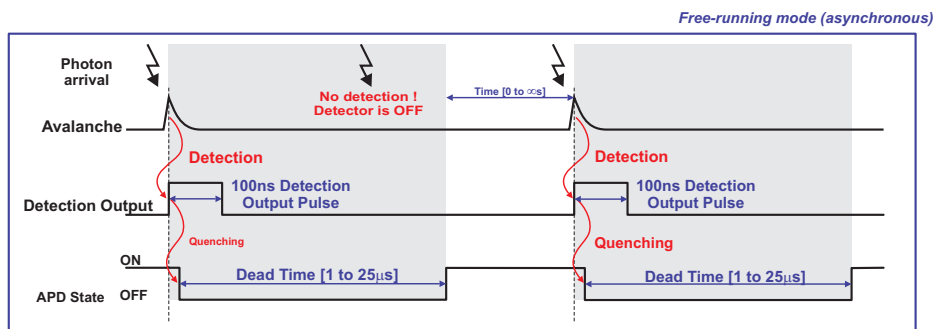
USER FRIENDLY SOFTWARE

The ID Qube NIR Free-Running comes with an intuitive control software and graphical user interface that allows the user to set the efficiency level and the deadtime through a simple USB interface.

The module can also operate in standalone mode disconnected from the PC. The ID Qube settings are reloaded upon each power up.

TIME CONTROLLER SERIES BUNDLE

Take your experiment a step further. Operate the ID Qube with a Time Controller, IDQ's central platform which combines the functionalities of a time-tagger, delay and pattern generator.
It is even possible to generate conditional pulses thanks to the unique computing capabilities of the Time Controller.

The ID Qube Series exists in 2 versions:
- ID Qube NIR Free-running
- ID Qube NIR Gated

SIMTRUM

ID Qube NIR Free-Running

SPECIFICATIONS

Parameter				Units
Wavelength range	900 - 1700			nm
Deadtime range	0.1 - 80			µs
Deadtime step	100			ns
Output pulse voltage	LVTTL / NIM			
Output pulse width	10			ns
Optical fibre coupling	MMF62.5 or free-space			
Efficiency range calibrated at λ=1.55 µm	10, 15 or 20 [1]			%
Timing resolution (FWHM) at 20% efficiency	150			ps
Dark count rate at (efficiency)	10	15	20	%
STD	1.2	3	6	kHz
LN	0.8	1.5	3	kHz
Gate-in max frequency	1			MHz
Gate-in min pulse duration	500			ns
Gate-in voltage range	-2 to 3			V
Gate-in coupling	50 DC			Ω
Gate-in threshold voltage range	-2 to 2			V
Gate-in threshold voltage resolution (steps)	1			mV
Electrical connections	SMA			
Optical interface	FC/PC fiber pigtail with metallic outer protection or Free-Space			
Dimensions	95 x 95 x 95			mm
Weight	1			kg
Cooling time @ Switch On	< 5			min
Power supply				
Consumption	100-240 VAC; 1.4 A; 50-60 Hz			
Supplied AC/DC adapter	+12 VDC; 60 W			

[1] Other efficiencies can be calibrated on demand

Supplied Accessories
+12V, 60 W, AC/DC power adapter, with AC power cord
Region adapted power cord
1.8 m USB cable
Optical fibre cleaner
Optical table mechanical support
Rubber feet
C-mount adapter (free space model only)