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SPAD Lambda (λ)

A high-performance single-photon linear array

DESCRIPTION

SPAD Lambda (λ) is a photon-counting linear array with time gating and time tagging. The core of the detector is a SPAD array with 320×1 pixels. Photon counting with up to 555’000 frames per second and zero readout noise is achieved. Nanosecond time gating is coupled with 17 ps gate phase shift. Time tagging with 20 ps resolution and 130 ps FWHM precision is available.

KEY BENEFITS

Linear detection array

SPAD Lambda (λ) features a single line with 320 single-photon detectors. This form factor is suitable for spectral applications that require high-speed, low light performance and/or single photon timing.

Wide detection spectra and low noise

Our single-photon detectors are fabricated in a state-of-the-art CMOS process and offer a low dark count rate of less than 250 cps. Microlenses enhance the detection with a peak detection efficiency of over 45%.

High tagging and gating

The sensor features both time tagging and time gating to study time varying signals of interest, this offers the most flexible approach to filter out unwanted signal while still preserving the arrival information of single-photons.

Plug and Play

The system requires just a 5V power adapter and two USB3 cables to run. For full flexibility, 4 additional control lines can be connected to the SMA connectors. The industry standard C/CS-mount optical port and the M4 screw mounting positions offer a flexible integration into any existing optical setup.

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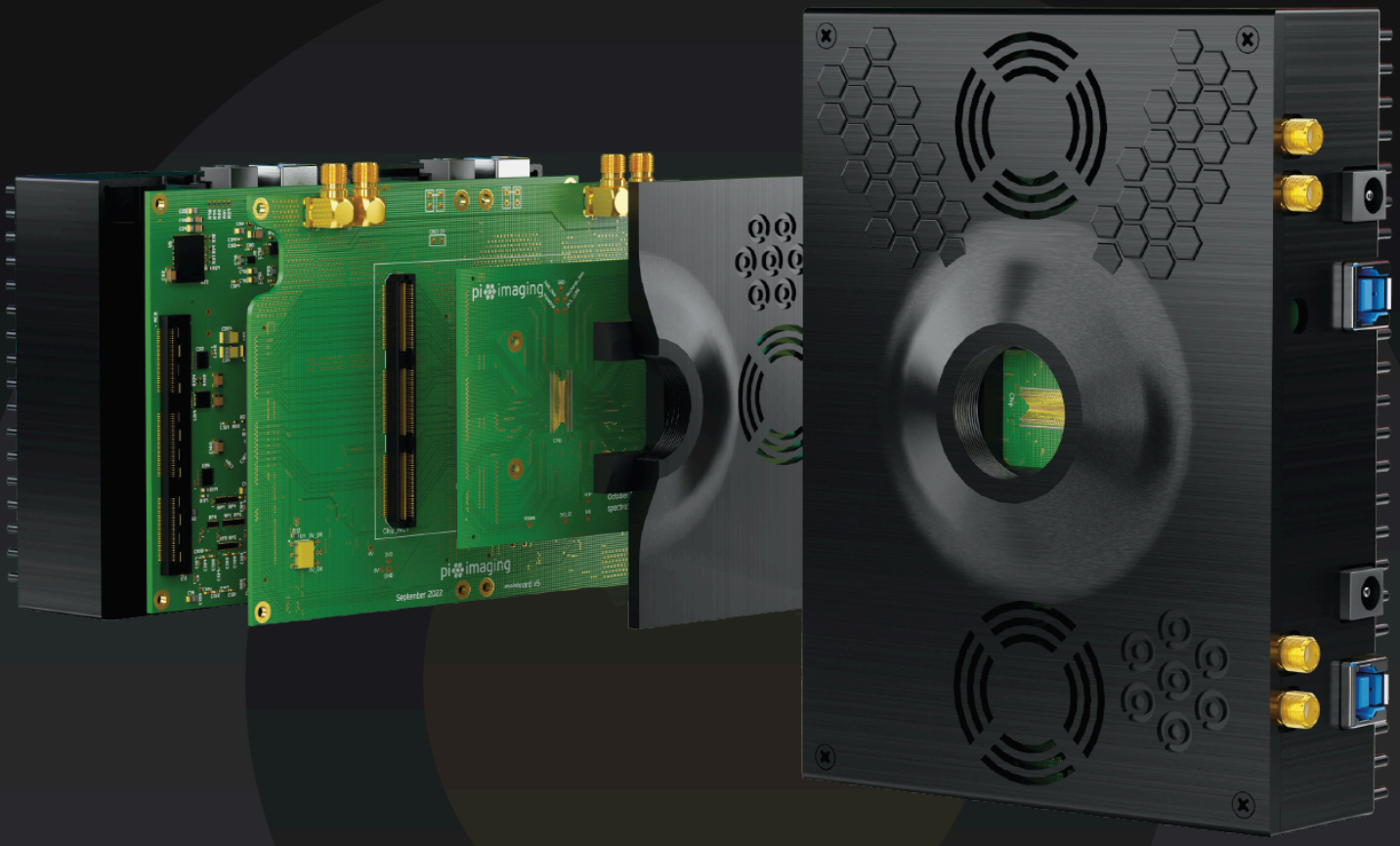

APPLICATIONS

Fluorescence lifetime imaging

SPAD Lambda (λ) increases the overall photon throughput compared to point scanned detection systems from the typical 10 Mcounts per second to 4 Gcounts per second.

Why SPAD Lambda (λ)?

- Simplify FLIM setup
- Increase FLIM frame rate

Flow cytometry

SPAD Lambda (λ) enables 320 spectral channels with shot noise limited SNR and integration times down to 1.8 µs.

Why SPAD Lambda (λ)?

- Simplify multichannel detection
- Improve signal to noise ratio

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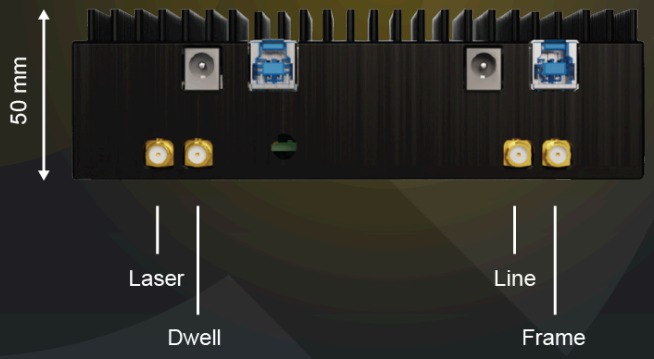
TECHNICAL SPECIFICATIONS

PARAMETER	LINEAR SPAD ARRAY
Resolution	320 x 1
Pixel pitch	29 µm
Sensor wavelength range	400 to 900 nm
Peak photon detection probability	50% @ 520 nm
Fill factor with microlenses	>80% for collimated light
Median dark count rate at room temperature	<250 cps
Percentage of pixels with > 10 kcps	5%
Frame rate (max.)	555'000 fps
Dead time	10 ns
Timing jitter	130 ps FWHM
Time-tagging resolution	20 ps
Minimum exposure/gate width	4 ns
Minimum exposure/gate shift	17 ps
Crosstalk	2%
Connection Type	C-Mount



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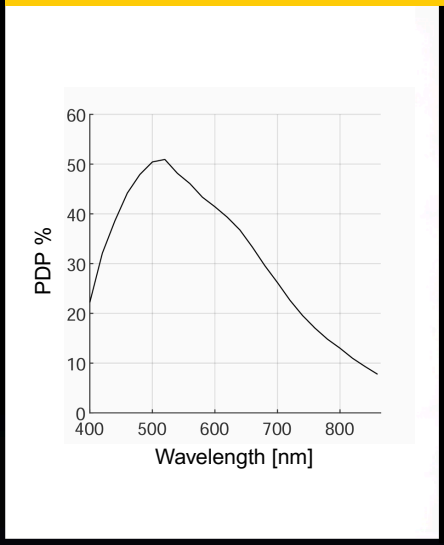
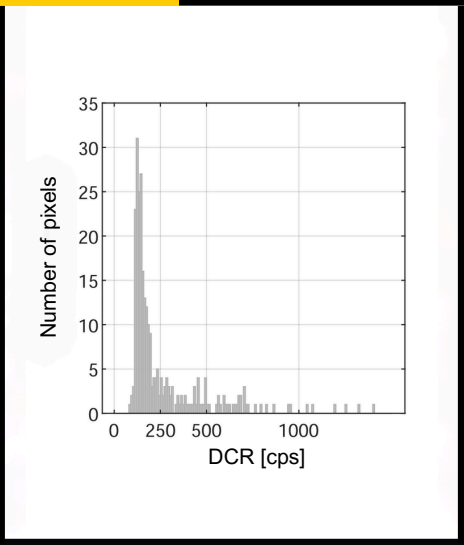
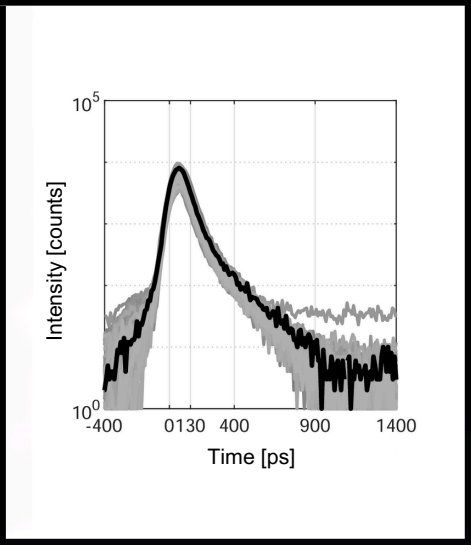
PERFORMANCE CHARACTERISTICS



Photon detection probability.



Typical distribution of dark count rate over the SPAD array.



Timing jitter over all the pixels, with an average of 130 ps FWHM.

SYSTEM INTEGRATION

A system overview is shown on the right. For operation, only a 5 V power supply and two USB3 connections are required.

The software provides functionalities for photon-counting, time-gating and time-tagging modes. It can be accessed through TCP/IP for easy integration into LabVIEW, MATLAB, Python or C++.

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