Improving biomedical applications with a time-resolved CMOS SPAD sensor

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REFERENCES


THE RA-I LINE SENSOR

The applied sensor is a single photon avalanche diode (SPAD) based CMOS sensor with 256x2 pixels, with 4x4 SPADs for detection in the red and blue spectra. The sensor can work in photon counting mode, or time-resolved mode for TCSPC and CMM. Efficient time-stamping of photons is provided by 256 parallel time-to-digital converters (TDCs).

Dark count rate (DCR) at different bias voltages for red SPADs (left). DCR is around 1000 counts per second (CPS) at 1.2 V excess bias voltage (20.46 V).

The TDC resolution has an average of 426 ps (right). FWHM of the instrument response function (IRF) is between 0.6-1.5 ns (bottom right). New sensor version is designed with improved properties [2].

Additional time-gating can be applied in each mode with adjustable location and width of 1.4 ns resolution (left).

THE PROTEUS PROJECT

The Proteus project focuses on developing a fibre optic based system for detection of lung diseases of critically ill patients in vivo in situ, through the use of fluorescent smart probes.

Plan to deploy CMOS SPAD line sensors into this system for video rate spectral fluorescence lifetime imaging (FLIM) and detection of various physiological parameters in the lung.

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