Fully integrated single-detector single-photon avalanche diode receiver approaching the quantum limit

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ABSTRACT

A single-photon receiver utilizing an integrated single-photon avalanche diode together with a gating circuit in 0.35-µm CMOS is presented. By transmitting the data stream as return-to-zero signal with a duty cycle of 20% and by transmitting one bit separated into 5 sub-bits, a sensitivity of -69.5dBm is achieved at 20 Mb/s. This corresponds to a gap to the theoretical quantum limit given by the Poisson distribution of the received photons of less than 10dB. At 50Mb/s still a sensitivity of -64.5dBm is achieved if 4 sub-bits are used. If no sub-bits are used, up to 100Mb/s data rate is possible at a sensitivity of -51.6dBm.

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