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Single Photon Avalanche Diodes with high-speed sub nanosecond periodic gating ALESSANDRO RESTELLI, JOSHUA C. BIENFANG, CHARLES W. CLARK, Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland — InGaAs/InP single-photon avalanche diodes (SPADs) are good candidates for single-photon detection in the near infrared range. Compared with their visible-range silicon counterparts however, their performance is limited by strong afterpulsing, which requires a significant recovery time after each detection event, reducing the maximum allowable count rate. Recent experimental work has shown that minimizing the avalanche current by gating the devices with sub-nanosecond bias pulses can allow InGaAs/InP SPADs to operate at higher repetition rates, albeit with lower detection efficiency. Multiple techniques have been used to extract the extremely weak avalanche signals from the large transient signals imposed by the gating pulses themselves. In this work we make a quantitative comparison of a variety of these avalanche-discrimination techniques by implementing them with a single InGaAs/InP SPAD in the sub-nanosecond gating regime and present results for detection efficiency, dark count probability, and afterpulsing probability.

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