

Abstract Submitted  
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**High-speed single-photon signaling for daytime QKD** JOSHUA BIENFANG, ALESSANDRO RESTELLI, CHARLES CLARK, NIST/JQI — The distribution of quantum-generated cryptographic key at high throughputs can be critically limited by the performance of the systems' single-photon detectors. While noise and afterpulsing are considerations for all single-photon QKD systems, high-transmission rate systems also have critical detector timing-resolution and recovery time requirements. We present experimental results exploiting the high timing resolution and count-rate stability of modified single-photon avalanche diodes (SPADs) in our GHz QKD system operating over a 1.5 km free-space link that demonstrate the ability to apply extremely short temporal gates, enabling daytime free-space QKD with a 4% QBER.<sup>1</sup> We also discuss recent advances in gating techniques for InGaAs SPADs that are suitable for high-speed fiber-based QKD. We present afterpulse-probability measurements that demonstrate the ability to support single-photon count rates above 100 MHz with low afterpulse probability. These results will benefit the design and characterization of free-space and fiber QKD systems.

<sup>1</sup>A. Restelli, J.C. Bienfang, A. Mink, and C.W. Clark, *IEEE J. Sel. Topics in Quant. Electron* **16**, 1084 (2010).

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