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**Detector dead-time effects in high-speed quantum key distribution** DANIEL ROGERS[1], JOSHUA BIENFANG, ANASTASE NAKASSIS, CHARLES W. CLARK, National Institute of Standards and Technology — Recent advances in quantum key distribution (QKD) have given rise to systems that operate at transmission periods significantly shorter than the dead times of their component single-photon detectors. As systems continue to increase to multi-gigahertz transmission rates, the effects of detectors with dead times on the order of 50 ns become progressively more important. We demonstrate that security constraints in the presence of finite dead times create the seemingly-counterintuitive situation where an increase in transmission rate results in a decrease in sifted bit rate. We present an analytic model of this condition and propose novel and efficient methods to mitigate its effects. We further show that there exists an optimal transmission rate to achieve maximum secret key production for given detectors and link loss and verify that analysis with a Monte Carlo simulation.

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