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Towards passive polarization compensation of quantum key distribution signals for free-space quantum communication (G)*

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As the world becomes ever more connected, activities such as online banking, shopping and personal data storage will become increasingly popular. The security of these services is essential since private information is involved. Cryptography that rely on computational complexity have not been proven to be secure. Quantum key Distribution (QKD) uses the physical phenomena prevalent in the quantum nature of light to perform cryptanalytically secure key transfer. Implementations of QKD is continuing to move from the research laboratory to real world applications. Fiber based QKD systems are already commercialized and free-space systems are rapidly developing. For free-space applications, one of the many challenges of perfect implementation is aligning and maintaining the reference frame of the polarization states that are sent over the communication channel. Current solutions require active polarization compensation, while passive compensation techniques can drastically reduce implementation costs and hardware. One experimental method being examined utilizes polarization-maintaining fibers (PMF) to properly define one polarization basis by taking advantage of the fiber core properties. I will present this implementation employing entangled photons to show its feasibility for free-space quantum communication applications.

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