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Experimental techniques to enhance the performance of quantum key distribution systems YI ZHAO, BING QI, XIONGFENG MA, HOI-KWONG LO, CQIQC, Dept. of Physics and Dept. of ECE, University of Toronto — Practical quantum key distribution (QKD) system has many imperfections, causing several security concerns. Nonetheless, people have proven the security of imperfect practical QKD systems. There are several approaches to enhance the performance of practical QKD system. A famous one is the decoy method, which can dramatically improve the efficiency of QKD (i.e., higher key rate, longer transmission distance) without jeopardizing the security. Another one is the phase randomization, which can improve the security of the QKD system (by making it closer to theoretical assumptions) without reducing the efficiency. Here, we report the *first* experimental implementations of the decoy method¹ and the active phase randomization². We implemented two decoy state QKD protocols: the one-decoy protocol over 15km telecom fiber, and the weak+vacuum protocol over 60km telecom fiber. We also implemented the active phase randomization over 5km. The experimental results confirmed the phase randomization and that the efficiency of QKD system was not reduced.

¹Y. Zhao *et. al.*, Phys. Rev. Lett., **96**, 070502 (2006); Y. Zhao *et. al.*, in *Proceedings of IEEE ISIT* (IEEE, 2006) pp. 2094-2098.

²Y. Zhao, B. Qi, and H. -K. Lo, Appl. Phys. Lett., **90**, 044106 (2007).

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