



Contribution ID: 262

Type: Poster Presentation

Development of Quantum Key Distribution System

Wednesday, 6 July 2016 16:10 (1h 50m)

Abstract content
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Quantum Key Distribution (QKD) is a process of producing and distributing the key information between groups of people or between two parties[1]. It is one of most advanced quantum information technology which uses quantum mechanics to guarantee the security of the communication. The implementation of QKD is realized by using an appropriate protocol. The sender (Alice) and the receiver (Bob) are connected by two channels. One is a quantum channel which is used for quantum transmission. In the case of sending photons this channel is generally either an optical fibre or free space. The second one is a classic channel which is used for the post – processing of the measurement bits, discarding all improper measured bits. The post – processing is performed to correct the errors obtained in shared key and erase all the information that an eavesdropper usually referred to as Eve could have obtained[2].

There exist many different protocols for providing a secure key i.e. BB84 protocol which is the first and most known protocol, the B92 protocol, the E91 protocol and many more[2]. In this work, all these protocols are defined and their differences will be discussed focusing on an extensive study of the BB84 protocol. An experiment set up is constructed to reproduce this protocol using a single photon source and free space as a quantum channel. A shared key is obtained and a quantum bit error rate (QBER) is calculated to give an idea how efficient the system is. Error detection and correction is achieved using cascade protocol and privacy amplification methods are discussed.

The conclusion is made according to the results obtaining during the QKD process.

References

1. Wiesner, S., Conjugate Coding. 1983. 15(1): p. 10.
2. Nicolas Gisin, et al., Quantum cryptography. Reviews of Modern Physics, 2002. 72(1): p. 51.

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Session Classification: Poster Session (2)

Track Classification: Track F - Applied Physics