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Comparison Qubit Errors Rates of Weak Coherent Pulse Laser and SPDC Sources for BB84 Protocol in One- meter Free Space

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Quantum key distribution (QKD) concerns creation and distribution of unbreakable symmetric one-time keys which are used in classical message encryption and decryption. Using quantum properties, the QKD security is enhanced by observation of qubit errors rates (QBER). Although the quantum principles, such as no-cloning theorem, imply that QKD has strong safety, the imperfect devices can yield weak points for eavesdropping attacks. Thus, the evaluation of QBER during contact is important to ensure that QKD is secured. We aim to evaluate and compare QBER of the QKD BB84 protocol process between different photon source models; namely, the model using a weak corent laser pulse which is attenuated to obtain the average photon number per pulse (μ) equal to 0.05, and the model using the spontaneous parametric down conversion (SPDC) photon source, which has 2000 photon pairs per second in one-meter free space. We devise an experimental setup to measure QBER in both models, where the linear optical devices are used and calibrated to obtain appropriate operators acting on quantum states. Additionally, we build an electronic circuit using Aruino to generate 2360 Hz laser pulse and collect raw keys to calculate the QBER. The experimental results will be discussed.

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