Verification of Quantum Key Distribution via Description and Implementation of Mixed States

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Classical cryptography cannot realize whether eavesdropper exists. By introducing quantum mechanics to cryptography, finding out eavesdropper is possible. We are aiming to investigate the E91 protocol, one of the quantum cryptography is secure. Our goal is to check the protocol’s security by proving that the absolute value of the shared CHSH value drops less than 2 under the measurement of an eavesdropper. Then, we will observe CHSH inequality violation via using undergraduate optics lab instruments-measuring entangled photons produced by sandwich BBOs through specific polarization bases and confirmed the protocol by inserting an eavesdropper using a pair of calcite. Furthermore, key distribution in reality was proceeded using Aer and Terra, units provided by IBM's Qiskit, and is calculated to confirm the presence of eavesdropper, and S>2, S<2with and without eavesdropper was obtained respectively, corresponding exactly with the other results in this research.

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