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Communication distance and security improvement in satellite based quantum key distribution via photon polarization pseudo-random bases encoding

New protocol to achieve very long-distance and secure communication between two legitimate users (Alice and Bob) namely, the pseudo-random entangled photon based QKD protocol using a low-earth-orbit (LEO) type satellite as the photon source relay is proposed. We assume the combined type-I and type-II SPDC as photon source distributing entangled photons pairs to Alice and Bob, and the quantum logistic map (QLM) as PRNG in order to pseudo-randomly select photon polarization
states measurement bases. Under these considerations, the secure key rate upper bound is evaluated and numerical simulations show that, the maximum communication distance increases significantly with the photon block size, and with the error correction function. One also observes that the protocol can tolerate a secure communication up to about 19000 km under lower background error (or lower atmosphere diffraction). The secure key privacy is strongly improved since public discussion is avoided due to the use of PRNG, which guarantees identical measurement bases choice between Alice and Bob. Based on the above, our protocol is more efficient. In addition, the secure key privacy is significantly amplified.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

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