

# Simple implementation of quantum key distribution based on single-photon Bell-state measurement

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Recently some alternatives to the measurement-device-independent (MDI) quantum key distribution (QKD) based on the single-photon Bell-state measurement (SBSM) were proposed. Although these alternatives are not precisely as secure as the MDI QKD, they possess the advantage of a high key rate of the traditional BB84-like protocol and avoid the technical complexity of two-photon interference required in the MDI QKD. However, the setups of these proposed schemes are rather complicated compared to commonly used BB84 systems. Here we propose a simple implementation of SBSM-based QKD that is directly built on the existing realization of the BB84 QKD.

Our proposal exhibits the hidden connection between the SBSM-based QKD and traditional phase-encoding QKD protocols. This finding discloses the physics behind these two different types of QKD protocols. In addition, we experimentally demonstrate the feasibility of our protocol.