

Passive scheme with a photon-number-resolving detector for decoy-state quantum key distribution with an untrusted source

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A passive scheme with a photon-number-resolving (PNR) detector and a beam splitter which are used to monitor the statistical characteristics of photon source, is proposed to verify the security of vacuum+weak decoy-state quantum key distribution system with an untrusted source. The practical imperfection due to statistical fluctuation and detection noise is considered in the passive-scheme analysis. The simulation results show that the scheme can work efficiently when the data size $\geq 10^8$ and the dark-count rate of PNR detector is kept below 0.5 counts per pulse, which are realizable by current techniques. We also give an experimental example of PNR detector which is easily realized by a variable optical attenuator combined with a practical threshold detector.

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