

SELECTED TOPICS IN ADVANCED ELECTRONICS

Edited by
Khalid A. S. Al-Khateeb



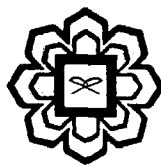
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CHAPTER 10

THE DECOY STATE METHOD IN QUANTUM KEY DISTRIBUTION

By

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Synopsis

Single photon sources may be useful for quantum computing, but they are rather impractical for QKD. Attenuated light pulses are more useful as signals in practical QKD systems. However employing attenuated pulses instead of perfect single photons brings another attack strategy; the photon-number splitting (PNS) attacks [125,126,127]. This does not apply only to pulse schemes, but affects all sources, which have a finite probability of emitting multiple photons. If all the signal photons are emitted with the same qubit encoding, Eve can steal a copy of the information without Alice and Bob noticing it.

The beam splitting attack is based on the concept that a lossy quantum channel can be described as a combination of a lossless channel and a beam splitter. The photons of the incoming signal states are redirected statistically to Eve and Bob. In principle, Eve could arrange an eavesdropping method by first measuring the number of photons in each pulse without disturbing the degree of freedom encoding the qubits using a quantum non-demolition measurement. The measurement does not perturb the qubit, and does not destroy the photons. The measurement is performed in the photon number Hilbert space.