World Academy of Science, Engineering and Technology
International Journal of Information and Communication Engineering
Vol:9, No:06, 2015

Assessment of Exploitation Vulnerability of Quantum Communication Systems with Phase Encryption

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Abstract : Quantum communication technology takes advantage of the intrinsic properties of laser carriers, such as very high data rates and low power requirements, to offer unprecedented data security. Quantum processes at the physical layer of encryption are used for signal encryption with very competitive performance characteristics. The ultimate range of applications for QC systems spans from fiber-based to free-space links and from secure banking operations to mobile airborne and space-borne networking where they are subjected to channel distortions. Under practical conditions, the channel can alter the optical wave front characteristics, including its phase. In addition, phase noise of the communication source and photo-detection noises alter the signal to bring additional ambiguity into the measurement process. If quantized values of photons are used to encrypt the signal, exploitation of quantum communication links becomes extremely difficult. In this paper, we present the results of analysis and simulation studies of the effects of noise on phase estimation for quantum systems with different number of encryption bases and operating at different power levels.

Keywords : encryption, phase distortion, quantum communication, quantum noise
Conference Title : ICCIT 2015 : International Conference on Communication and Information Technology
Conference Location : New York, United States
Conference Dates : June 04-05, 2015