

Abstract

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Reliable FSO System Performance Matching Multi-level Customer Needs in Alexandria City, Egypt, Climate: Sandstorm Impact with Pointing Error

Free space optical (FSO) communication is one of the recent promising new access technologies. FSO provides data transmission with high security and unlimited bandwidth with low cost of installation. Optical signal absorption and scattering are the two main factors of attenuation due to the terrestrial channel. Pointing error is a technical factor that causes attenuation of the signal which results from the misalignment of the transmitter and the receiver. This paper investigates the FSO performance for an atmospheric channel in Alexandria city, Egypt. The study covers the operating wavelength, modulation technique, receiver aperture diameter, and type of photodetector. The study considers the practical average of meteorological measurements for Alexandria city obtained from Egyptian Meteorological Unit. The system performance is evaluated by its bit error rate, signal-to-noise ratio, and the received power at different system parameters. The system is studied by simulation and experimentally using Optisystem ver. 15.2. It is found that the FSO system is so sensitive to the transmitter–receiver misalignment. However, the effect of thermal noise and background noise could not be neglected compared to the resulting pointing error due to the Mediterranean climate which is mainly characterized by high temperature and humidity. After this integrated parametric study for the system performance, we deduced the practical application availability for the system starting from low to higher data rates with respect to climate and system parameters. Therefore, one can ensure that the system can be used on a wider scale of customers.