

Performance Analysis of FSO Communication System: Effects of Fog, Rain and Humidity

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Abstract—Free Space Optics (FSO) is one of the most promising new access technologies. FSO provides the transmission of data with unlimited bandwidth. The atmospheric attenuation is caused by two main factors absorption and scattering. This paper investigates a performance study of free space optics channel for variable wavelengths 850 nm, 950 nm and 1550 nm at distance range of 1 km. The simulation reports minimum BER for NRZ-OOK modulation technique at different receiver diameters in presence of fog, rain and humidity attenuation. The obtained results reflect the system improvement achieving minimum BER and maximum received power that can be detected at distance 1 km.

Keywords—free space optics (FSO); fog; rain; humidity.

II. ATTENUATION MODEL FOR FSO

The interaction between the laser beam and air molecules and aerosols along the propagation produces the atmospheric attenuation. The beam power has an exponential decay relation with the propagation distance.

The transmittance for an optical wavelength is the relation of the transmitted power P and the received power P_r of an atmospheric link distance L . According to Beer-Lambert law as shown in (1) the optical transmittance τ is [7,8]:

$$\tau = \frac{P_r}{P} = e^{-\alpha L} \quad (1)$$