

Effect of Atmospheric Turbulence on Hybrid FSO/RF Link Availability under Qatar's Harsh Climate

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Abstract : Although there has been a growing interest in the hybrid free-space optical link and radio frequency FSO/RF communication system, the current literature is limited to results obtained in moderate or cold environment. In this paper, using a soft switching approach, we investigate the effect of weather inhomogeneities on the strength of turbulence hence the channel refractive index under Qatar harsh environment and their influence on the hybrid FSO/RF availability. In this approach, either FSO/RF or simultaneous or none of them can be active. Based on soft switching approach and a finite state Markov Chain (FSMC) process, we model the channel fading for the two links and derive a mathematical expression for the outage probability of the hybrid system. Then, we evaluate the behavior of the hybrid FSO/RF under hazy and harsh weather. Results show that the FSO/RF soft switching renders the system outage probability less than that of each link individually. A soft switching algorithm is being implemented on FPGAs using Raptor code interfaced to the two terminals of a 1Gbps/100 Mbps FSO/RF hybrid system, the first being implemented in the region. Experimental results are compared to the above simulation results.

Keywords : atmospheric turbulence, haze, hybrid FSO/RF, outage probability, refractive index

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