

# Abstract

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## **Performance Evaluation of FSO System with MIMO Technique in Different Operating Environments**

Free Space Optical (FSO) communication is a promising solution for the need of very high data rate point-to-point communications. However, the wireless optical communications in the atmosphere were influenced by atmospheric absorption, scattering and turbulence which lead to signal attenuation and result in considerable degradation of the system performance. Since the average transmitted power is limited owing to the requirements for safety of human eye, prudent measures must be taken into account in the design of the basic units of such type of communication systems in order to exploit its great benefits under all weather conditions. In this paper, our objective is to design a MIMO-FSO link and analyze its performance in difficult background conditions. The achievable performance improvements, including received power levels, bit error rate (BER) and Q-factor, are demonstrated in the presence of atmospheric attenuation. Our numerical results are obtained for SISO as well as MIMO system with elements varying from 2 to 4. For each one of these schemes, along with the evaluation of received power, Q-factor, and BER, the system performance is predicted through the analysis of the eye diagram. It was found that, the received power is increased by approximately 12 dB in the case of MIMO system with 4 elements when the operating environment is slightly foggy. On the other hand, higher Q-factor, 64.7, and lower BER are achieved by the same system in the case where the background is ideal.