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Performance Analysis of FSO Systems using Different Modulation Techniques under the Influence of Atmospheric Turbulence

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Abstract

Free Space Optics (FSO) communications is an emerging technology that offers high-speed data rate, highbandwidth, license-free and strong security against eavesdropping. However, the system performance mainly depends on the atmospheric phenomena, particularly atmospheric turbulence , as it can degrade and shut down the link. Modulation technique is the most affordable and simplest method to mitigate the turbulence problem without any additional devices, thus reducing the complexity and cost. This paper investigates the FSO performance under weak turbulence using Optisystem software based on various modulation schemes such as On-Off Keying Non-Return to Zero (OOKNRZ), Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK) and Eight-Quadrature Amplitude Modulation (8-QAM) to mitigate the turbulence effect and increase the FSO link performances. Bit Error Rate (BER), Quality factor (Q-factor), and eye diagram analysis are used to analyse the FSO performance . The results show that the 8-QAM modulation scheme gives the best performance , followed by QPSK, BPSK and OOK-NRZ with the Q-factor of 6.20, 6.06, 5.69, and 5.55, respectively. Keywords-Free space optics (FSO), modulation , atmospheric turbulence , BER, eye-diagram, Q-factor © 2021 IEEE.

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