ABSTRACT

The performance of the Free Space Optic (FSO) communication system can be influenced by several parameters, namely, wavelength, distance, aperture diameter, weather conditions, and the modulation technique used. This research aims to analyze the performance of the FSO system using On-Off Keying (OOK) and Pulse Position Modulation (PPM) at wavelengths of 1310 nm and 1550 nm with a power of 10 dBm, conducted under three testing scenarios. Observations were made by analyzing the Bit Error Rate (BER), optical Signal-to-Noise Ratio (SNR), electrical SNR, and q-factor. The first testing scenario involved varying the distance from 0,2 km to 1,4 km with increments of 0.2 km, all under very clear air weather conditions. In the second scenario, the testing involved changing the aperture diameter on both the transmitter and receiver sides, ranging from 5 cm to 30 cm, again under very clear air weather conditions. The third scenario included testing under various weather conditions such as dense fog, thick fog, moderate fog, light fog, very light fog, light mist, very light mist, clear air, and very clear air, all at a diameter of 30 cm. Based on the research results, in the first scenario, with a wavelength of 1310 nm, PPM modulation exhibited better performance with a BER of $5{,}78 \times 10^{-311}$ at a distance of 0,2 km, while at a wavelength of 1550 nm, OOK modulation showed better performance with a BER of $3{,}89 \times 10^{-312}$. In the second scenario, with a wavelength of 1310 nm, OOK modulation demonstrated better performance with a BER of $3{,}32 \times 10^{-34}$ at a distance of 30 cm, whereas at a wavelength of 1550 nm, PPM modulation performed better with a BER of $5{,}78 \times 10^{-32}$. Finally, in the third scenario, based on the wavelength of 1310 nm, PPM modulation displayed better performance with a BER of $3{,}65 \times 10^{-311}$, whereas at a wavelength of 1550 nm, OOK modulation demonstrated better performance with a BER of $3{,}98 \times 10^{-315}$ under very clear air weather conditions.

Keywords: *FSO, PPM, OOK, Modulation, BER*