

# Abstract

**Moustafa Hussein Aly**

## **Improved Performance of M-ary PPM in Different Free-Space Optical Channels due to Reed Solomon Code Using APD**

Atmospheric turbulence induced fading is one of the main impairments affecting the operation of free-space optical (FSO) communication systems. In this paper, the bit error rate (BER) of M-ary pulse position modulation (M-ary PPM) of direct detection and avalanche photodiode (APD) based is analyzed. Both log-normal and negative exponential fading channels are evaluated. The investigation discusses how the BER performance is affected by the atmospheric conditions and other parameters such as the forward error correction using Reed Solomon (RS) codes and increasing Modulation level. Results strongly indicate that, RS-coded M-ary PPM are well performing for the FSO links as it reduces the average power required per bit to achieve a BER below  $10^{-9}$  in both turbulence channels.