

# Abstract

**Mohamed R Abaza**

## **BER Performance of M-ary PPM Free-Space Optical Communications with Channel Fading**

In this paper, we have shown the advantage of using 4-ary pulse position modulation (PPM) using intensity modulation with direct detection (IM/DD) as a power efficient system over coherent differential phase shift keying (DPSK) as a bandwidth efficient system in free space optical (FSO) weak turbulence channel (log-normal channel) and strong turbulence channel (negative-exponential channel). The comparison is done using avalanche photodetector (APD) and PIN receivers. A correct expression is derived for DPSK in negative-exponential channel using APD. The performance of 4-ary PPM is enhanced using high order 256-PPM modulation and forward error correction (FEC). We employed standard Reed-Solomon RS (255,239) and RS (255,223). This work was further extended by exploiting concatenated Reed-Solomon codes, RS (255,239) as an outer code and RS (255,223) as an inner code for higher efficiency.