Abstract

Moustafa Hussein Aly

Power Distribution and BER in Indoor VLC with PPM Based Modulation Schemes: A Comparative Study

Visible light communication (VLC) uses an intensity-modulation and direct-detection scheme to transmit data. The light source utilized in VLC structures is constantly switched on and off rapidly, resulting in flickering. Furthermore, most of illumination systems exclude dimming support to permit customers to dim the light source to the desired stage. Therefore, the modulation scheme for information transmission in VLC should consist of flicker mitigation and dimming manage abilities. Double inverse pulse position modulation (DIPPM), sub-carrier pulse position modulation (SC-L-PPM), and M-ary variable pulse position modulation (M-VPPM) are recommended for minimizing the flicker issues and supporting an excessive degree of dimming for VLC systems. In this paper, a comparison is introduced between DIPPM, SC-L-PPM, and M-VPPM according to error performance and bit rate. In addition, a simulation is carried out to measure the optical power distribution for a LED lamp in an indoor room topology for each modulation technique. The obtained results indicated that SC-L-PPM is the best choice regarding the bit error rate (BER) and optical power distribution compared to the other two schemes. A 10?6 BER is achieved with a very low power requirement at L = 8, while a remarkable power distribution of 1.5–6.5 dBm is observed from 3 × 5 × 5 m3 room corners to the center, respectively. According to the bit rate, it is noticed that, M-VPPM is the most efficient one compared to the two other schemes. It achieves 2.3 × 107 bps at a signal to noise ratio (SNR) of 22 dB and M = 8.