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Pilot-Assisted Direct-Current Biased Optical Orthogonal Frequency Division Multiplexing Visible Light Communication System

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Abstract : Visible light communication (VLC) is a new approach of optical wireless communication proposed to support the congested radio frequency (RF) spectrum. VLC systems are combined with orthogonal frequency division multiplexing (OFDM) to achieve high rate transmission and high spectral efficiency. In this paper, we investigate the Pilot-Assisted Channel Estimation for DC biased Optical OFDM (PACE-DCO-OFDM) systems to reduce the effects of the distortion on the transmitted signal. Least-square (LS) and linear minimum mean-squared error (LMMSE) estimators are implemented in MATLAB/Simulink to enhance the bit-error-rate (BER) of PACE-DCO-OFDM. Results show that DCO-OFDM system based on PACE scheme has achieved better BER performance compared to conventional system without pilot assisted channel estimation. Simulation results show that the proposed PACE-DCO-OFDM based on LMMSE algorithm can more accurately estimate the channel and achieves better BER performance when compared to the LS based PACE-DCO-OFDM and the traditional system without PACE. For the same signal to noise ratio (SNR) of 25 dB, the achieved BER is about 5×10⁻⁴ for LMMSE-PACE and 4.2×10⁻³ with LS-PACE while it is about 2×10⁻¹ for system without PACE scheme.

Keywords : channel estimation, OFDM, pilot-assist, VLC
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