

ABSTRACT

Visible Light Communication (VLC) is one of the technologies commonly implemented in underwater visible light communication systems. However, underwater situations cannot be separated from various kinds of external disturbances such as marine life, waves, noise, turbulence, etc. In this study, the modulation techniques are On-Off Keying Non-Return to Zero (OOK-NRZ), On-Off Keying Return to Zero (OOK-RZ), and Pulse Width Modulation (PWM). In addition, the water medium that used is pure sea water and coastal ocean with Gamma-Gamma Turbulence as an underwater channel model where there are weak, medium, and strong turbulence schemes.

In this study there are two scenarios that are simulated. The first scenario is to examine the effect of the distance changes on BER modulation and SNR in the pure sea water where there are three different distances between transmitter and receiver and the same value of the rate of dissipation of mean squared temperature (X_T) and the rate of dissipation kinetic energy (ϵ) parameter. The second scenario is to examine the effect of the distance changes on BER modulation and SNR in the coastal ocean.

The result of the simulation shows that PWM Gamma becomes a modulation technique which has optimal performance to be implemented in an underwater visible light communication system. It can be seen from the BER value under weak turbulence which is 50 m in pure sea water the BER OOK-NRZ Gamma is 2.2175×10^{-8} , the BER Gamma OOK-RZ is $2,1603 \times 10^{-20}$ and the BER Gamma PWM is $8,8399 \times 10^{-31}$. Meanwhile, at moderate turbulence, which is 60 m in the coastal ocean media, the BER OOK-NRZ Gamma is 0,0015, the BER Gamma OOK-RZ is $1,2984 \times 10^{-9}$ and the BER Gamma PWM is $4,8818 \times 10^{-14}$. Therefore, it can be concluded that the higher the turbulence level, BER performance will get worse.

Keywords: VLC, gamma-gamma turbulence, OOK-RZ, OOK-NRZ, PWM, pure sea water, coastal ocean.