Abstract

Underwater wireless optical Communication (UWOC) systems have been identified as a suitable replacement technology with high data rates over relatively medium transmission ranges for underwater communication. In this thesis, the performance of UWOC system was experimentally and numerically investigated. In the experimental system, letters were sent using UWOC system using a new combination of pulse position modulation (PPM) with - digital pulse interval modulation (DPIM) format. Laser source of wavelength 650 nm was used with a power of 60 mW. The letters was optically modulated by PPM-DPIM and then launched to the water channel. Both clear and salty water with various salt concentrations were all utilized to carry the transmitted signal. In addition, the effects of turbulence due to bubbles in clear and salty water channels were studied. The bubble source is located at 25 cm, 50 cm, and 75 cm apart from the transmitter.

The results show that the attenuation and letter error rate (LER) were raised with increasing the salt concentrations. The attenuation was elevated from 0.72 to 1.74dB for increasing salt concentration from 5% to 25% in 1m distance without bubbles. However, higher attenuation and LER can be observed when the bubble source has existed. Further, the position of the bubble source influences their values, where they reach their higher values when the bubble source at 25 cm from the transmitter. The proposed UWOC system was numerically investigated to explore the performance with more factors. Signal quality was obtained with varying transmitted power for “a”, “e” and “h” letters to examine the effect of laser power on the system performance. In addition, LER and eye diagrams are plotted with respect to channel length for “a”, “e”, and “h” letters in clear water with and without bubbles and 15% salty water channels.