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BER evaluations for multimode beams in underwater turbulence

Serap Altay Arpali, Yahya Baykal & Çağlar Arpali

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Abstract

In underwater optical communication links, bit error rate (BER) is an important performance criterion. For this purpose, the effects of oceanic turbulence on multimode laser beam incidences are studied and compared in terms of average BER (<BER>), which is related to the scintillation index. Based on the log-normal distribution, <BER> is analysed for underwater turbulence parameters, including the rate of dissipation of the mean squared temperature, the rate of dissipation of the turbulent kinetic energy, the parameter that determines the relative strength of temperature and salinity in driving index fluctuations, the Kolmogorov microscale length and other link parameters such as link length, wavelength and laser source size. It is shown that use of multimode improves the system performance of optical wireless communication systems operating in an underwater medium. For all the investigated multimode beams, decreasing link length, source size, the relative strength of temperature and salinity in driving the

index fluctuations, the rate of dissipation of the mean squared temperature and Kolmogorov microscale length improve the <BER>. Moreover, lower <BER> values are obtained for the increasing wavelength of operation and the rate of dissipation of the turbulent kinetic energy in underwater turbulence.

Keywords:

Oceanic optics | oceanic propagation | turbulence | bit error rate | underwater optical communication links

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Disclosure statement

No potential conflict of interest was reported by the authors.

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