ABSTRACT

The increase in the exchange of long-distance communication information continues to grow in today's telecommunications world. Long-distance communication makes it difficult for information signals to be sent directly to the recipient (receiver) because of the influence of noise so that it requires a modulation process in exchanging information. This study performs simulations on 16-QAM and 64-QAM modulation using Additive White Gaussian Noise (AWGN) and Rayleigh Fading channels with data quality levels after the transmission process is carried out. The simulation process uses two scenarios, namely AWGN and Rayleigh Fading channels with two modulations, namely 16-QAM and 64-QAM modulation. The parameter to determine the quality of the modulation signal in this study is by looking at the bit error rate (BER) value obtained from the simulation using Matlab. The modulation simulation results obtained are compared between the modulations in this case the 16-QAM and 64-QAM modulations, then will be compared with the BER theory. The simulation results obtained from the two channel scenarios used are the use of power in 64-QAM modulation is more wasteful than in 16 QAM modulation, this is because to achieve BER 10^{-3} 64 QAM modulation requires energy per bit to power spectral density ratio (E_b/N_0) a larger to reach a BER of 10^{-3}. The 16-QAM modulation of the AWGN channel in the simulation results to achieve BER 10^{-3} requires E_b/N_0 of 10.6 dB and for Rayleigh Fading channel requires E_b/N_0 of 27.3 dB. The theoretical result of 16-QAM modulation of AWGN channel to achieve BER 10^{-3} requires E_b/N_0 of 10.4 dB while for Rayleigh Fading channel requires E_b/N_0 of 26.3 dB. The simulation results of 64-QAM AWGN channel modulation to achieve BER 10^{-3} require E_b/N_0 of 14.5 dB and Rayleigh Fading of 30.5 dB. The theoretical result of 64-QAM modulation of AWGN channel to achieve BER 10-3 requires E_b/N_0 of 14.1 dB while for Rayleigh Fading channel it requires E_b/N_0 of 30 dB. The difference between the theoretical and simulation results is not very significant in this study indicating a small error namely, (0.131 and 0) for the simulation results of 16-QAM modulation AWGN channel, (0.119 and 0) for the theory of BER 16-QAM modulation AWGN channel, (0.196 and 0.0000329) for simulation results of 16-QAM modulation Rayleigh Fading and (0.174 and 0.00000468) for the theory of BER 16-QAM modulation Rayleigh Fading channel while for the simulation results of 64-QAM modulation AWGN channel (0.109 and 0.000000397), (0.097 and 0.0000000148) for the theory of 64-QAM modulation AWGN channel, (0.2 and 0.0000113) for simulation results for 64-QAM Rayleigh Fading channel modulation and (0.188 and 0.0000102) for the theory of 64-QAM Rayleigh Fading modulation BER.

Keywords : *16-QAM and 64 QAM modulation, AWGN, Reyleigh Fading*