ANALISIS KINERJA SISTEM OFDM MENGGUNAKAN MODULASI M-QAM DAN PENGKODEAN LDPC PADA IMPLEMENTASI KOMUNIKASI 5G

SKRIPSI

Diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar Sarjana
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ABSTRAK

Kebutuhan komunikais 5G yang terus meningkat memerlukan sistem komunikasi 5G yang dapat bekerja dengan baik. Penelitian ini bertujuan untuk menganalisis sistem OFDM (*Orthogonal Frequency Division Multiplexing*) dengan variasi teknik modulasi M-QAM yaitu 16-QAM, 64-QAM, dan 256-QAM, variasi pengkodean kanal LDPC dengan coderate ½, ¾, $^{8}/_{9}$, dan variasi kanal AWGN serta *multipath fading*. Untuk pengujian kinerja sistem OFDM menggunakan standar 3GPP TS 38.211 versi 16.2.0 dengan mengamati grafik BER terhadap SNR dan grafik PAPR terhadap CCDF. Hasil dari penelitian menunjukkan sistem OFDM dengan modulasi 16-QAM memiliki kinerja yang paling baik dibandingkan dengan modulasi 64-QAM dan 256-QAM. Kemudian, sistem OFDM dengan pengkodean LDPC *code rate* ½ memiliki kinerja yang paling baik dibandingkan dengan *code rate* ¾, dan $^{8}/_{9}$. Kemudian, kinerja sistem OFDM dengan kanal AWGN memiliki kinerja yang lebih baik dibandingkan sistem dengan kanal *multipath.* Jadi dapat disimpulkan sistem OFDM yang menggunakan modulasi 16-QAM *coderate* ½ dan kanal AWGN memiliki kinerja yang lebih baik untuk implementasi komunikasi 5G.

Kata Kunci : OFDM, M-QAM, LDPC, AWGN, Multipath fading, 5G.

ABSTRACT

The increasing need for 5G communication requires a 5G communication system that can work well. This study aims to analyze the OFDM (Orthogonal Frequency Division Multiplexing) system with variations of M-QAM modulation techniques, namely 16-QAM, 64-QAM, and 256-QAM, variations of LDPC channel coding with coderates ½, ¾, and $^{8}/_{9}$ and variations of AWGN channels and multipath fading. For testing the performance of the OFDM system using the 3GPP TS 38.211 version 16.2.0 standard by observing the BER graph against SNR and the PAPR graph against CCDF. The results of the study show that the OFDM system with 16-QAM modulation has the best performance compared to 64-QAM and 256-QAM modulation. Then, the OFDM system with LDPC coding code rate ½ has the best performance compared to code rates ¾, and $^{8}/_{9}$. Then, the performance of the OFDM system with AWGN channels has better performance than the system with multipath channels. So it can be concluded that the OFDM system using 16-QAM coderate ½ modulation and AWGN channels has better performance for 5G communication implementation.

Keywords: *OFDM, M-QAM, LDPC, AWGN, Multipath fading, 5G.*

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DAFTAR GAMBAR

DAFTAR SINGKATAN

AWGN	: *Additive White Gaussian Noise*
ASK	: *Amplitude Shift Keying*
BER	: *Bit Error Rate*
CCDF	: *Complementary Cumulative Distribution Function*
FEC	: *Forward Error Correction*
FFT	: *Fast Fourier Transform*
FBMC	: *Filter Bank Multi-Carrier*
FSK	: *Frequency Shift Keying*
ICI	: *Intercarrier Interference*
ISI	: *Intersymbol Interference*
ITU	: *International Telecommunication Union*
LDPC	: *Low Density Parity check*
MIMO	: *Multiple Input Multiple Output*
MLE	: *Maximum Likelihood Equalization*
MMSE	: *Minimum Mean Square Error Equalization*
M-PAM	: M-ary *Pulse Amplitude Modulation*
M-QAM	: M-ary *Quadrature Amplitude Modulation*
NLOS	: *Non Line of Sight*
NMSA	: *Normalize min-sum*
OFDM	: *Orthogonal Frequency Division Multiplexing*
PAM	: *Pulse Amplitude Modulation*
PAPR	: *Peak to Average Power Ratio*
PSK	: *Phase Shift Keying*
SNR	: *Signal Noise Ratio*
UFMC	: *Universal Filtered Multi-Carrier*
WOLA	: *Wavelet OFDM with Low PAPR*
ZFE	: *Zero Forcing Equalization*

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