UNIVERSITI TEKNOLOGI MARA

SPACE TIME FREQUENCY DIVERSITY TECHNIQUES FOR ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING USING MULTIPLE INPUT MULTIPLE OUTPUT CHANNELS

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Abstract

In telecommunications, multi antenna communication systems with orthogonal frequency division multiplexing (OFDM) have the potential to play an important role in the design of the next generation broadband wireless communication systems. This paper proposes novel space time frequency block code (STFBC) diversity for OFDM transmissions over frequency selective Rayleigh fading channel by using 64 QAM and 256 QAM modulation scheme with insertion Maximum Likelihood Decoding process by using Linear Equalizer. In this research, we will deal with four transmit antennas and three receive antennas. As will be shown, the performance of diversity system depends on the combining scheme in order to choose the highest signal to noise ratio (SNR) and lowest noise by using free selective fading chanel. The design of STFBC is to achieve full spatial diversity against Rayleigh fading channel. A comparison will be made, which OFDM modulation techniques with propose double decode (Cyclic Decoding and Maximum Likelihood Decoding) will give better result in diversity technique and to prove that diversity better than no diversity base on bit error rate (BER). The result shows that 256 QAM Modulation techniques is having better performance compared to 64 QAM Modulation Techniques. This project use MATLAB version R2007a to simulate the performance of STFBC.

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CHAPTER 1

INTRODUCTION

1.1 Wireless Challenges and Solution

Recently, the need of very high the speed of the internet using broadband wireless channels have become a great factor of the high emerging in communications systems. This phenomena cause rapid development of wireless communications environment. In order to overcome the rapid increase of data service demands, a broadband approach to the air interface is a great potential method to provide high-rate services at minimum cost and delay but produced high quality for future mobile communications beyond 3G systems.

Orthogonal Frequency Division Multiplexing (OFDM) has been paid a great potential in the broadband multipath channels based in wireless access which is regarded as a capable modulation technique in the forward link for the systems beyond IMT-2000[1,2]. OFDM is a modulation technique that can be utilized for high data rate wireless transmission to combat multipath fading.

OFDM has overcomes for the most critical situation happened with both FDMA and TDMA. This situation occur due to splitting existing bandwidth of OFDM into several narrow band channels normally between 100 to 8000 narrow band channels. The carriers are made orthogonality to one another for each channel, to let them to be placed very close without overhead, similar to FDMA technique. As a result there is no need for