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PERFORMANCE ANALYSIS OF PAIR-WISE ERROR PROBABILITY FOR 1/3 AND 1/4 SUBCARRIER MAPPING ICI-SC SCHEME IN STFBC MIMO-OFDM SYSTEM

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

In the latest development of Orthogonal Frequency Division Multiplexing (OFDM) communication system, the system performance can be distracted by the Frequency Offsets (FOs) which can demolish the orthogonality of the subcarriers, increases the Inter-Carrier Interference (ICI) and can intensely deteriorate the system performance. As a result, Intercarrier Interference Self-Cancellation (ICI-SC) has been applied in numerous OFDM systems as a simple and impressive approach to overcome ICI. The need of higher data rates and improved coverage with an efficient bandwidth has revealed the potential of the combination of multiple input multiple output (MIMO) and Orthogonal Frequency Division Multiplexing (OFDM) as a powerful technique which can provide high data rates over frequency selective fading channels. ICI and maximum frequency diversity can also be achieved by manipulating the Space Time Frequency Block Codes (STFBCs) that uses spatial, time and frequency diversities which is implemented in the MIMO-OFDM system. The uncompromising frequency selective fading caused due to the multipath channel between the transmitter and the receiver and also the amount of time delay at the receiver from a signal travelling from the transmitter along different paths. This excess delay can cause both ISI to the adjacent OFDM symbols and the Inter-Carrier Interference (ICI) within the same symbol. An equalization technique is appended at the receiver to overcome ICI and ISI. Evaluation of Pair-Wise Error Probability (PEP) performance using STFBC MIMO-OFDM ICI-SC technique with one third and quarter subcarrier mapping scheme to diminish ICI due to Frequency Offsets (FOs) is achieved. Adaptive algorithms is also implemented with the specific equalizer in order to further improve the system performance. Thus, the objective of this research is to minimize ICI and ISI effects through STFBC ICI-SC subcarrier mapping scheme and equalization techniques. The simulation results expressively show that the one third method subcarrier mapping technique with Decision Feedback Equalizer (DFE) and adaptive algorithm can provide the best system performance compared to the existing subcarrier mapping methods .The results shows that by using the one-third subcarrier mapping scheme with an adaptive algorithm Normalised Least Means Square (NLMS), an efficient bandwidth can be achieved, ICI and ISI effects can be reduced with 24% of improvement compared to one-third subcarrier mapping Recursive Least Square (RLS) DFE in the MIMO-OFDM system.

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Most Compassionate, the Merciful,

Praise to ALLAH, Lord of the Universe.

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CHAPTER ONE
INTRODUCTION

1.1 INTRODUCTION

This chapter describes about an overview on methods or schemes that has been used in the project and the expected overall performance respectively. The problem statement will be analyzed and finally come up with a suitable objectives. Furthermore, it will also state on the scope of the project work and the organization of the thesis report.

1.2 BACKGROUND STUDY

In recent developments in communication technologies, the renowned Orthogonal Frequency Division Multiplexing (OFDM) communication system has been dedicated to numerous applications such as digital audio or video broadcasting (DAB/DVB), Worldwide Interoperability for Microwave Access (WiMAX), and HIPERLAN2 (High Performance Radio Local Area Network) systems [1]. OFDM in combination with Multiple Input Multiple Output (MIMO) has unleashed the potential to fulfill the requirements for the next generation services such as 3rd Generation Partnership Project (3GPP) and Long Term Evolution (LTE) for Fourth Generation (4G) in mobile network [2]. MIMO is being adapted in the wireless technology which offers great advantages through spatial multiplexing gain, and improved link reliability due to antenna diversity gain. MIMO system uses multiple antennas at both sides to increase capacity of wireless channel without the need of extra bandwidth. The implementation of multiple antennas at both sides of the link can provide extra gain which is called spatial multiplexing gain. Thus, can increase the spectral efficiency [3].

MIMO-OFDM has become the most promising candidate for 4G broadband wireless communication systems.This is because MIMO-OFDM systems can enhance the data rates in frequency selective fading channels, capable to cope with higher data rates, with significant potential performance enhancements over existing wireless technology by merely exploiting the space, time and frequency domains [4].