

UNIVERSITI TEKNOLOGI MARA

**LOW DENSITY PARITY CHECK (LDPC) FOR SPACE
TIME FREQUENCY CODING IN MIMO-OFDM**

EZMIN BINTI ABDULLAH

**Dissertation submitted in partial of the requirements
for the degree of**

**Master of Science in Telecommunication and Information Engineering
Faculty of Electrical Engineering**

January 2013

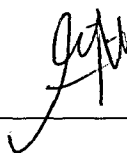
CANDIDATE'S DECLARATION

I declare that the work in this thesis was carried out in accordance with regulations of Universiti Teknologi MARA. It is original and is result of my own work, unless otherwise indicated or acknowledge as referenced work. This topic has nor been submitted to any other academic institution or non-academic institution for any degree or qualification.

In the event that my thesis be found violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

Name of Candidate : Ezmin Binti Abdullah
Candidate's ID No. : 2011411286
Programmed : EE770
Faculty : Electrical Engineering
Thesis Title : Low Density Parity Check (LDPC) For Space Time
Frequency Coding in MIMO-OFDM

Candidate's Signature :



Date :

25 JANUARY, 2013

ACKNOWLEDGEMENT

In the name of God, Most Beneficent, Most Merciful. All the praises and thanks to Him, the Lord of the universe. Peace upon His messenger Muhammad, the last of the prophets and the righteous followers. I am very grateful to the Almighty God for all the strengths, wisdom, patience, perseverance and ability bestowed upon me to complete this final project report.

I would like to express my extremely gratitude, appreciation and thousand thanks to my supervisor, Ir Muhammad@Yusoff b. Ibrahim, for his guidance, advice and patient during the period of completing this project. His knowledge and support throughout this project has made this work smooth and successful.

I wish to thank and dedicate this work to my beloved husband Muhamad Nabil b. Hidayat for his support and understanding, to my well behaved children Arissa Aqilah Ai Bt. Muhamad Nabil and Amanee Akhtar Bt. Muhamad Nabil for being my strengths and also to my parents Abdullah Haji Mohd Zain and Zuriyah Arshad; and family for their encouragement, moral support and continuous doas during the progress of this research and throughout the MSc studies.

Finally, I also wish to thank to those individuals and colleagues who shared their suggestions and evaluations of this report.

Thank you.

ABSTRACT

MIMO-OFDM offers significant high data rates transfer without increasing the bandwidth or transmit power. By adopting diversity coding such as Space Time coding (STC), Space Frequency Coding (SFC), Space Time Frequency Coding (STFC), the major challenge of transmitting information over a long distances can be improved in terms of reliability and security of the data due to ISI and ICI. Low Density Parity Check which is introduced by Gallager in 1962 has attracted much attention to the needs of efficient and reliable coding theory in digital data communication system. In this paper together with STFC, the simulation of LDPC under 8, 16 and 64 QAM is conducted in 4x4 MIMO-OFDM over Additive White Gaussian Noise (AWGN) and Raleigh fading channel. The propose system is analyzed based on BER with signal to noise ratio (SNR). The simulation using Matlab, shows the BER comparison between AWGN and Rayleigh fading channel, which LDPC works better in Rayleigh fading channel while in digital modulations the system outperforms with 8-QAM . The performance of LDPC between MIMO-OFDM and MISO OFDM is also being compared and it is further prove that MIMO performs better than MISO [1].

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
TABLES OF CONTENTS	v
LIST OF FIGURES	vii
LIST OF TABLES	ix
LIST OF ABBREVIATIONS	x
CHAPTER	
1 INTRODUCTION	
1.0 CHAPTER OVERVIEW	1
1.1 OVERVIEW	1
1.2 PROBLEM STATEMENT	3
1.3 OBJECTIVES	3
1.4 SCOPE OF THE RESEARCH	3
1.5 THESIS STRUCTURE	4
2 LITERATURE REVIEW	
2.0 CHAPTER OVERVIEW	5
2.1 ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING (OFDM)	5
2.2 MIMO-OFDM	8
2.3 DIGITAL MODULATION	12
2.4 SPACE TIME FREQUENCY CODING (STFC)	14
2.5 LOW DENSITY PARITY CHECK CODE (LDPC)	18
2.6 CHANNEL MODEL	20
2.6.1 JAKE'S MODEL	21
2.6.2 DENT MODEL	23
2.7 MAXIMUM LIKELIHOOD	23