PERFORMANCE OF SPACE TIME BLOCK CODING IN AN IEEE 802.16-2004 IN AN OFDM PHYSICAL LINK

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ABSTRACT

This paper highlights the performance of Space Time Block Coding in an IEEE 802.16-2004 OFDM physical link. The evaluation was done by comparing the performance of the system which include Space Time Block Coding and with the system that exclude the Space Time Block Coding. The system parameters that were used in this study were the cyclic prefix (CP) factor which is 1/4, 1/8/, 1/16, 1/32 and a range of SNR which is -10 to 10. BER is evaluated from these parameters and compared between the two systems. This study has been done using MATLAB 7.5.0 (R2007b). The finding shows that the BER value is lowest in the system which has the Space Time Block Coding (STBC). Overall, it shows that with Space Time Block Coding, the performance of Wireless System is better by 99.97% with a cyclic prefix at 1/32.

TABLE OF CONTENTS

CHAPTER	DESCRIPTION	PAGE
	TITLE	i
	SUPERVISOR APPROVAL	ii
	DECLARATION	iii
	DEDICATON	iv
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	TABLE OF CONTENTS	vii
	LIST OF FIGURE	viii
	LIST OF TABLE	ix
	LIST OF ABBREVIATIONS	x
1	**INTRODUCTION**	
	1.1 Background of Study	1-3
	1.2 Objectives	3
	1.3 Scope of Work	3
	1.4 MATLAB Simulation	4
	1.5 Organization of Thesis	4
2	**LITERATURE RIVIEW**	
	2.1 Space Time Diversity	5-6
	2.1.1 Space Time Block Coding (STBC)	6
	2.2 The Wimax Standard	6
	2.2.1 IEEE 802.16-2004	7
	2.3 OFDM	8
	2.3.1 OFDM Advantages	9
	2.3.3 OFDM Disadvantages	9
	2.4 Bit Error Rate (BER)	10
	2.5 Cyclic Prefix Addition	11
	2.6 Multiple Input Multiple Output (MISO)	11-12
3	**METHODOLOGY**	
	3.1 Simulation of Bit Error Rate (BER)	13
	3.1.1 OFDM Physical Link with STBC and without STBC	13-18

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

The experienced growth in the use of digital networks has led to the need for the design of new communication networks with higher capacity. The telecommunication industry is also changing, with a demand for a greater range of services, such as videoconferences, or applications with multimedia contents. The increased reliance on computer networking and the Internet has resulted in a wider demand for connectivity to be provided "any where, any time", leading to a rise in the requirements for higher capacity and high reliability broadband wireless telecommunication systems.

The wireless communication has many standards such as IEEE 802.11, 802.15, 802.16e and 802.16-2004. IEEE 802.16-2004 has been used in this study and based on the IEEE 802.16-2004 standard, WiMAX allows for an efficient use of bandwidth in a wide frequency range, and can be used as a last mile solution for broadband internet access. To achieve such a range and high data rate, the IEEE 802.16-2004 standard supports multiple-antenna techniques including space-time coding (STC)[1].

In recent years, space-time coding has gained much attraction as an efficient transmits diversity technique to combat fading in wireless communications and improve the capacity of wireless networks. Space-time coding relies on multi-antenna transmissions that are combined with appropriate signal processing at the receiver to provide a diversity gain. For a fixed number of antennas, their decoding complexity at the receiver increases exponentially with the transmission rate. To reduce decoding complexity, orthogonal space-time block codes with two transmit antennas were first introduced by Alamouti and later generalized to an arbitrary number of transmit antennas in. An attractive property of space-time block codes is that maximum-likelihood (ML) decoding can be performed using only linear processing. For complex constellations, space-time block coding with