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PAPR REDUCTION USING SELECTED CODEWORD SHIFT (SCS) TECHNIQUE AND SCS-SLM TECHNIQUE FOR SPACE TIME CODING MIMO-OFDM

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CONFIRMATION BY PANEL OF EXAMINERS

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ABSTRACT

In the world of increasing mobility, the emerging needs for the cellular and wireless communications have increased enormously. The demand of efficient, reliable and also high speed wireless communications network can be achieved by implementing multiple input multiple output (MIMO) and orthogonal frequency division multiplexing (OFDM). However, in recent years, information technology has progressively led to global energy consumption due to the demands of mobile communications around the world. In this level, the main component to reduce power consumption depends on the high-power amplifier (HPA) efficiency which is associated to the peak-to-average power ratio (PAPR). However, various techniques that have been proposed to reduce the high PAPR are encountered with some drawbacks such as computational complexity and bit error rate (BER) degradation. These drawbacks are due to the formulation and algorithm of the PAPR reduction techniques in the OFDM system to achieve substantial PAPR reduction. In this thesis, a new formulation for interleaving technique using circulant shift is proposed to form an optimum permutation for interleaving technique. In addition, an appended bit side information (SI) is proposed to avoid the BER degradation at the receiver. This technique is called selected codeword shift (SCS) technique. The technique has reduced the PAPR with approximately 19% using only six candidates and avoid the BER degradation effectively. Due to the advantages of proposed SCS, an enhancement of selective mapping (SLM) technique using SCS is proposed. This approach aim to give a booster to SLM in order to achieve substantial PAPR reduction as well as to improve BER degradation. This technique is called SCS-SLM technique in conjunction with combination of SCS and SLM. The results show that both aims are achieved with 28.6% PAPR reduction using six candidates and avoid 8% of the BER degradation in conventional SLM. Finally, the SCS technique and SCS-SLM technique are implemented in the MIMO-OFDM system in order to reduce the inherited PAPR problem. Diversity scheme which are space time (ST), space frequency (SF) and space time frequency (STF) are also introduced in this work to improve the BER performance. The results show that the SCS technique and SCS-SLM technique reduced the PAPR in all schemes and the best improvement is 33% of the PAPR reduction and 55% of the BER.

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CHAPTER ONE
INTRODUCTION

Wireless communication has become an essential system in providing people with prolific, sophisticated and ubiquity services. Wireless operation offers a short and long range communications that can connect users from all over the world. Therefore, the next generation of wireless communication systems demands high speed, high quality and robustness to frequency selective fading interference in order to provide reliable services to all users regardless the location of the users.

1.1 BACKGROUND STUDIES

The rapid development of wireless communications is required to accommodate a large number of users which increases yearly. Proportional to the recent lifestyle, high data rate wireless communication access is demanded by many applications such as internet access, multimedia stream and mobile computing. Traditionally, more bandwidth is required to provide a higher data rate transmission. However, this approach is impractical due to the expensive cost. Therefore, improvement in this area encourage more business opportunities as well as a non-stop research improvement [1].

A practical scheme to fulfill the demand of higher data rate are multiple input multiple output (MIMO) and orthogonal frequency division multiplexing (OFDM). The basic idea of MIMO is to transmit a data stream through multiple antennas. While for OFDM, a bandwidth efficient kind of system is introduced. This scheme allows multiple of carrier frequency overlap to each other with a certain frequency spacing to raise the bandwidth efficiency by maintaining total bandwidth similar to single carrier modulation. Another primary benefit of OFDM in comparison to single carrier scheme is its capability to protect from frequency selective fading due to multipath. Due to its efficiency and robustness, OFDM system has become a convincing scheme for most wireless broadband standard including Third Generation Partnership Project Long Term Evolution (3GPP-LTE) and Worldwide Interoperability for Microwave Access (WiMAX) [2].