1-1 Background

MIMO -OFDM is a key technology for next generation wireless communication In high-speed wireless communication, combining MIMO and OFDM technology OFDM can be applied to transform frequency-selective MIMO channel into parallel flat MIMO channel reducing the complexity of the receiver through multipath fading environment can also achieve high data rate robust transmission. Therefore, MIMO-OFDM systems obtain diversity gain and coding gain by space-time coding at the same time, the OFDM system can be realized with simple structure. Therefore, MIMO-OFDM system has become a welcome proposal for 4G mobile communication Mostly used MIMO-OFDM systems are the systems combination of MIMO and OFDM, which is modulation of multiplexing MIMO structure of this system has an advantages [1].

1-2 Problem statement:

The following three performance parameters may be used to describe the quality and usefulness of any wireless link Range-Speed-Reliability Prior to MIMO-OFDM system increasing any of the three parameters usually results in tradeoff for the other parameters but disadvantages of traditional MIMO-OFDM system can have high peak values in the time domain since many subcarrier components are added via an inverse fast Fourier transformation (IFFT) operation. As a result, OFDM systems are known to have a high peak-to-average power ratio (PAPR) when compared to single-carrier systems. In fact, the high PAPR is one of the most detrimental aspects in an OFDM system system Limitation of OFDM technique is the large PAPR (peak to average power ratio) that makes this drawbacks:

- That makes the designer in leaving high backoffs for amplifiers and hence limiting the power amplifier performance.
- Increasing the cost of the systems degrade the bit error rate(BER) due to inter-modulation noise occurring in the non-linear amplifier to mitigate use of higher resolution analog-to-digital-converters to prevent the signal from being clipped or carrier intermedulation to occur Hence, the need to reduce the PAPR of such systems this thesis focused investigates to solve this problem that we can see bellow

- In traditional MIMO-OFDM system the cyclic prefix (CP) is added before transmission to mitigate ISI effect it is wasted 25% of the original OFDM symbol (frame).

1-3 proposed solution:

To overcome of these problems used a discrete wavelet transform (DWT) in MIMO-OFDM instated to fast Fourier transform (FFT) to decrease a peak to average power ratio (PAPR) and avoiding cyclic prefix (CP) gives wavelet OFDM an advantage of roughly 25% in bandwidth efficiency that can led to increase in data rate and system capacity though increase in overall of system throughput.

1-4 Objectives:

Traditional MIMO- OFDM have high PAPR on the transmitted OFDM symbols the results in two disadvantages high bit error rate and interference between adjacent channels [1]. To overcome this problem would imply the need for linear amplification the consequence of linear amplification is more power consumption this has limited salutation, uses OFDM DWT as a modulation and demodulation technique is optimal solution [3] the main objectives of this research

1. To reduce PAPR for MIMO- OFDM system
2. To decrease system bit error rate (BER)
3. To increase system throuput (capacity)
4. implement MIMO-OFDM using different type of modulation

These objectives can be achieved by using OFDM based on DWT to implement MIMO-OFDM system instated of FFT in conventional system and use a different type of modulation technique to ensure performance of proposed system in term of above specific parameters compared to traditional system.

1-5 Methodology:

First step study and understand existing traditional MIMO- OFDM system and find out the characteristics performance of it then design a new system implemented using Labview simulation in which use Discrete Wavelet transform (DWT) instead of the Fast Fourier transform (FFT) ,because The OFDM implemented by using IFFT and FFT have some problems. One of a major problem of this system is the high peak-to average power ratio (PAPR). Due to this problem look at another type of modulation technique to generate the carrier. Many authors are proposed DWT [15 - 20], DWT has a high degree of side lobe suppression and the loss of orthogonality leads to lesser inter symbol interference (ISI) and inter carrier interference (ICI) than in conventional OFDM system [9].

The next step is to decide where to search for the relevant material as it is very important for efficient searching use a proposed DWT In order to achieve optimum performance of MIMO- OFDM system, and then design system models for proposed system and conventional system and compared a simulation results between two systems in term of PAPR, BER, capacity.

1-7 Motivation for Using Wavelets

- Wavelet transform can create subcarriers of different bandwidth and symbol length
- The ability of wavelets to arrange the time-frequency tiling in a manner that minimizes the channel disturbances minimizes the effect of noise and interference on the signal

- Wavelets give a new dimension, signal diversity which could be exploited in a cellular communication system, where adjacent cells can be designated different wavelets in order to minimize inter-cell interference..
- Wavelet-based algorithms have long been used for data compression. By compressing the data, a reduced volume of data is transmitted so that the communication power needed for transmission is reduced.

1-8 Thesis Outline:

This thesis is divided into five chapters organized as follows chapter two containing a survey of the main Concepts and overview of traditional MIMO-OFM system and throughout, and introduce and describe the principles of OFM system, then study and understand a problem of PAPR and its effect in MIMO-OFM system and type of PAPR reduction techniques . The main goal of Chapter three implement MIMO-OFM system model, by using labview simulation environment to design a proposed system (MIMO-OFM system based on DWT) and conventional system (MIMO-OFM system based on FFT). Chapter four provides simulation and result in this chapter discussed results of simulation chapter five is summarize and conclusion of this work and provide suggestion of future works.