IMPROVE COOPERATIVE DATA TRANSMISSION USING SC-FDMA-DMWT BASED WIRELESS COMMUNICATION NETWORKS

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ABSTRACT:

Wireless broadband is telecommunications technology that offers high-speed wireless Internet access or computer networking access over a wide area. The term includes both fixed and mobile broadband. The main tasks faced by wireless communication are obtain ability of resources similar bandwidth and transmission power. Too the wireless channel suffers from damages similar fading. Frequency Division Multiplexing (FDMA-DMWT) based subcarrier Channel losses must be alleviated at the receiver by using equalization methods. In these idea BER performance is minimized enhancements of SC-FDMA-DMWT schemes by dissimilar equalization Techniques such as Zero forcing (ZF), Minimum mean square error (MMSE) with successive interference cancellation are done over cooperative decode and forward relaying network. In this paper, a new cooperative scheme by using space time network SC-FDMA –DMWT system is proposed. Simulations are carried out under Rayleigh frequency flat channels with the throughput rate investigation

KEYWORDS: *FDMA-DMWT, Zero Forcing, Minimum Mean Square Error, Successive Interference Cancellation & Relaying Strategy*

1. INTRODUCTION

Orthogonal frequency-division multiplexing (OFDM) has lately advanced as one of the greatest common systems to overawed multipath fading. Single carrier frequency division multiple access (SC-FDMA) has also been approved as an alternative of OFDMA for uplink transmission in UTRA LTE[1]. To advance the performance of OFDMA and SC-FDMA, cooperative communication be able to be used. Though, modern cooperative protocol for multi-carrier scheme suffers with the topic of imperfect synchronization [2]. TDMA structure in which each node in the network transmits symbols in its devoted time slot can resolve the asynchronous difficult but provides rise to large time delay [3] The objective is to allow high-speed data transmission for mobile phones and data terminals at significantly reduced cost associated to current radio access technologies in order to advance the spectrum efficiency, the physical layer technologies specified in LTE Release 8 incorporate the methods such as Orthogonal Frequency Division Multiplexing (OFDM) as the DL multiple access scheme and Single-Carrier Frequency Division Multiple

Access (SC-FDMA) as the UL scheme. Presently, additional improvements are being considered to progress the current LTE Release 8 standard [4] . These developments are included in LTE- Advanced (too identified as LTE Release 10) standard, which is targeted to support much higher peak rates, higher throughput and coverage, and lower latencies, resulting in an improved user experience. The numerous UK networks are still scrabbling to expand their 4G LTE coverage but previously we're seeing 4G LTE-A or LTE-Advanced in some areas, which is basically a far faster type of the previously speedy 4G [5]. Read on for the low down on objective how fast it is, how it works and when you can become your hands on it. Here’s no hard and fast response as to how speedy LTE-A is. Theoretical peak download speeds stand at around 300Mbps whereas standard 4G LTE stands at 150Mbps [6]. Having said that you’ll likely find that the real world download speeds of 4G usually top out at about 15Mbps, as additional factors such as the device you're using it on, your proximity to a 4G mast and how various other people are on the network all radically affect the speeds. Likewise you're not likely to become reliable LTE-A speeds of 300Mbps, then it's still likely to supply reliable real world speeds of over 42Mbps and up to 90Mbps, making it at least 3 times faster than standard 4G LTE speeds. Fundamentally though standard data connections use one antenna and one signal at any given time, 4G LTE-A uses multiple signals and multiples antennas [7]. It usages MIMO (Multiple Input Multiple Output) technology to combine multiple antennas on both the transmitter and the receiver (for case a smartphone). So a 2x2 MIMO structure would mean there were two antennas on the transmitter and two on the receiver, the additional antennas theoretically the faster the potential speeds as the data streams can travel additional professionally [8]. Numerous newer handsets, chiefly high-end ones, such as the iPhone 6S, Samsung Galaxy S6, Sony Xperia Z5, HTC One M9, LG G4 and Microsoft Lumia 950 support it, but most older and lower end handsets don't. The respectable news is that over time additional and additional smartphones will arrive with LTE-A support and as it becomes additional extensive it must start filtering down to low end devices too. LTE-A not fast sufficient for you well this is a fast moving manufacturing and people are continuously looking ahead.

Thus much so that 5G is previously in advance. The term '5G' literally just means that it's the fifth generation of mobile wireless schemes and you can suppose it to be a big jump [9]. The fast growing communication for multimedia needs high speed and enhanced area and power. Thus DMWT is designed to meets the above condition. So the proposes IDMWT and DMWT based orthogonal modulator and demodulator. Even however DWT have the good properties but it is not satisfy the future needs. By implementing DMWT it is able to achieve good spectral efficiency and achieves good BER compare to FFT and DWT [10-12] .The particulars are still being worked out and it's unlikely to be commercially deployed before 2020, but talk at the moment is that it will theoretically permit for data speeds of up to 10Gbps, which is just a mind boggling number.

2. SYSTEM DESIGN IMPLEMENTATION

To achieve the max utilization, new multi access technique should be used. OFDMA is one such technique which can provide very high bandwidth but also produces high PAPR (Peak to average ratio). In mobile terminals we use batteries which should be efficient enough for uplink transmission. Single carrier frequency Division Multiple Access(SCFDMA) is an answer to overcome the high PAPR problem .SCFDMA has a lower PAPR which means it will not consume more power and by giving longer battery life to the user terminal. [5] Below figure 4 shows the block diagram of SC-FDMA transmitter and receiver.

This is similar to the block diagram of OFDMA except the two yellow blocks.SC- FDMA transmitter is used to convert the binary data into a sequence of modulated sub carriers which indeed transmitted through the radio channel. In order to do so many signal process operations are required. The idea behind the analogy implementation of OFDM can be extended to the digital domain by using the discrete Multi- wavelet Transform (DMWT) and its counterpart, the inverse discrete Multiwavelet Transform (IDMWT) [12]. These mathematical operations are widely used for transforming data between the time-domain and frequency-domain. From OFDM perspective, these transforms are interesting because they can be viewed as a mapping data into an orthogonal subcarrier. From the Figure (1), it is very clear that OFDMA is a multi- carrier system with one data symbol carried over by one subscriber whereas SC- FDMA is a single carrier system and it has one wider bandwidth subcarrier for each QPSK symbol.

Relay technologies in next generation wireless communication explains the use of highly successful co-operative networks/relaying approach in new and emerging telecommunications technologies such as full duplex radio, massive multiple input multiple output (MIMO), network coding and spatial modulation. The new application areas include visible light communications (VLC), wireless power transfer and 5G. [6] We propose a modulus arithmetic based zero-forcing (MZF) detector for multi-input multi-output (MIMO) channels. Traditionally, a ZF detector completely eliminates interference from other symbol layers when detecting a particular symbol layer, which results in suboptimal performance due to noise enhancement. The only constraint for application of our proposed MZF detector is that the transmitter must employ a finite cardinality M quadrature-amplitude-modulation (QAM) alphabet. With that, the modules operandi of the MZF is to allow for integer-valued interference and then remove it by modulus arithmetic operations [13].

In statistics and signal processing, a minimum mean square error (MMSE) estimator is an estimation method which minimizes the mean square error (MSE), which is a common measure of estimator quality, of the fitted values of a dependent variable. In the Bayesian setting, the term MMSE more specifically refers to estimation with quadratic loss function. In such case, the MMSE estimator is given by the posterior mean of the parameter to be estimated. Since the posterior mean is cumbersome to calculate, the form of the MMSE estimator is usually constrained to be within a certain class of functions. Linear MMSE estimators are a popular choice since they are easy to use, easy to calculate, and very versatile [14]. As shown in Figure 1

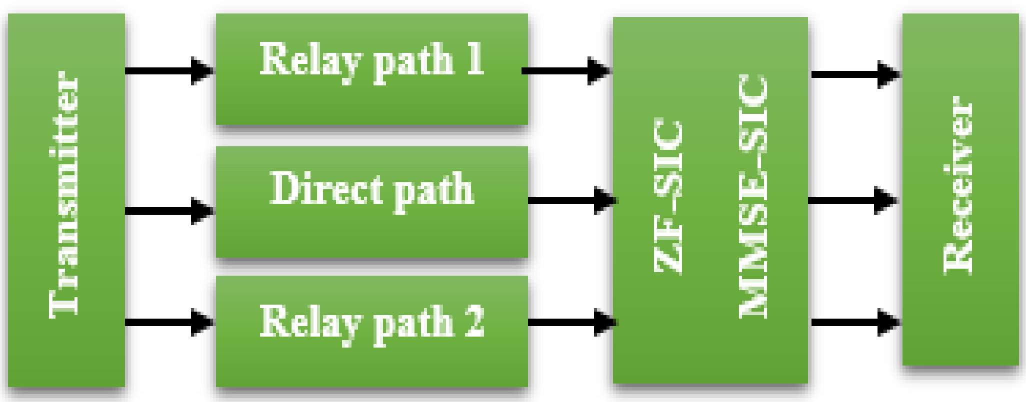

Fig.1 Relaying Strategy

When signals are detected successively, the outputs of previous detectors can be used to aid the operations of next ones which leads to the decision directed detection algorithms including SIC, Parallel Interference cancelation (PIC) [15], and multistage detection. ZF SIC with optimal ordering, and MMSE-SIC with equal power allocation Approaches the capacity of the Rayleigh fading channel. After the first bit is detected by the de correlates the result is used to cancel the interference from the received signal vector assuming the decision of the first stream is correct. For the ZF-SIC, since the interference is already nulled, the significance of SIC is to reduce the noise amplification by the nulling vector. SC FDMA uses DMWT prior to IDMWT module in the transmitter side and IDMWT [12] is added in the receiver end. The need to add this is to convert OFDM into SC FDMA. The reason to convert this is that SCFDMA, PAPR is usually low.

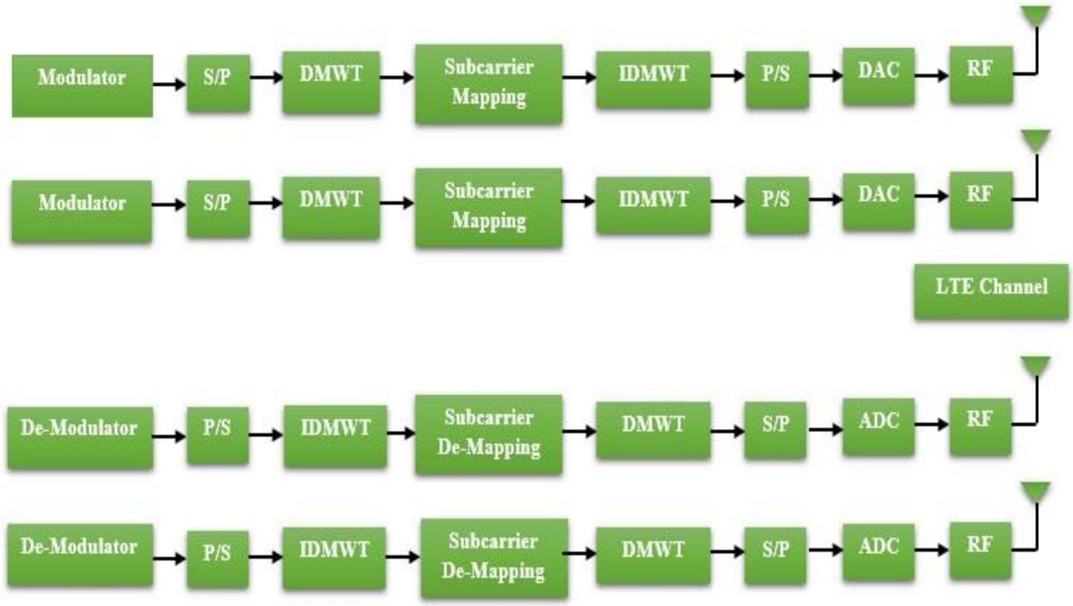

Fig. 2 Proposed SC-FDMA-DMWT Based Warless Communication Networks

3. EXPERIMENTAL RESULTS

In this paper the proposed system of LTE-SC-FDMA-DMWT is implemented and tested using the DMWT under the LTE channel cases which are Extended Pedestrian‑A (EPA), Extended Vehicular‑A (EVA) and Extended Typical Urban (ETU). The simulation is presented by MATLAB software .The factors of the model are listed in Table I.

Table 1.The parameters for LTE-SC-FDMA-DMWT

Parameters	Value
Modulation types	QPSK, 16QAM, 64QAM
Carrier Frequency fc (MHz)	2400
Channel types	LTE - Channel
Equalization type	MMSE
No. of useful carrier (N)	64
No. of total carrier (M)	1024
Target BER	10-4
roll-off factor (α)	0.0, 0.1, 0.2, 0.4, 0.6, 0.8, 1.0
Sub carrier mapping	Localized, Distributed, Interleaved

Thus, by transmitting data using relay strategy technique and using Zero Forcing and Minimum Mean Square Error equalizer, the following outputs were attained:

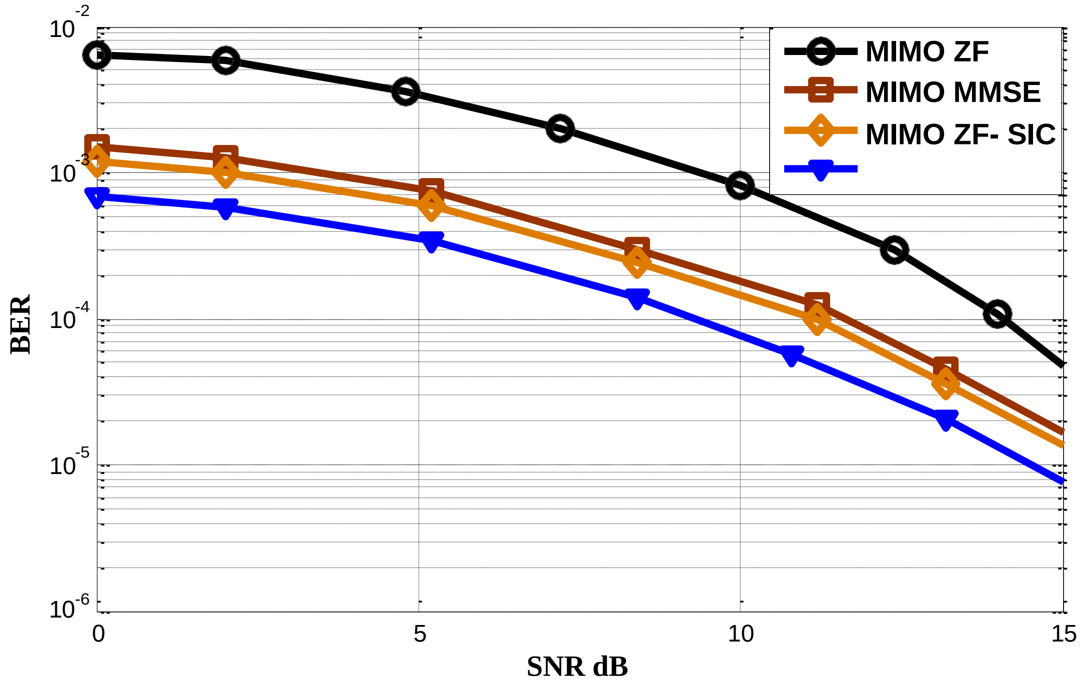

Fig. 3 SC-FDMA-DMWT Transceiver for BSPK Modulation

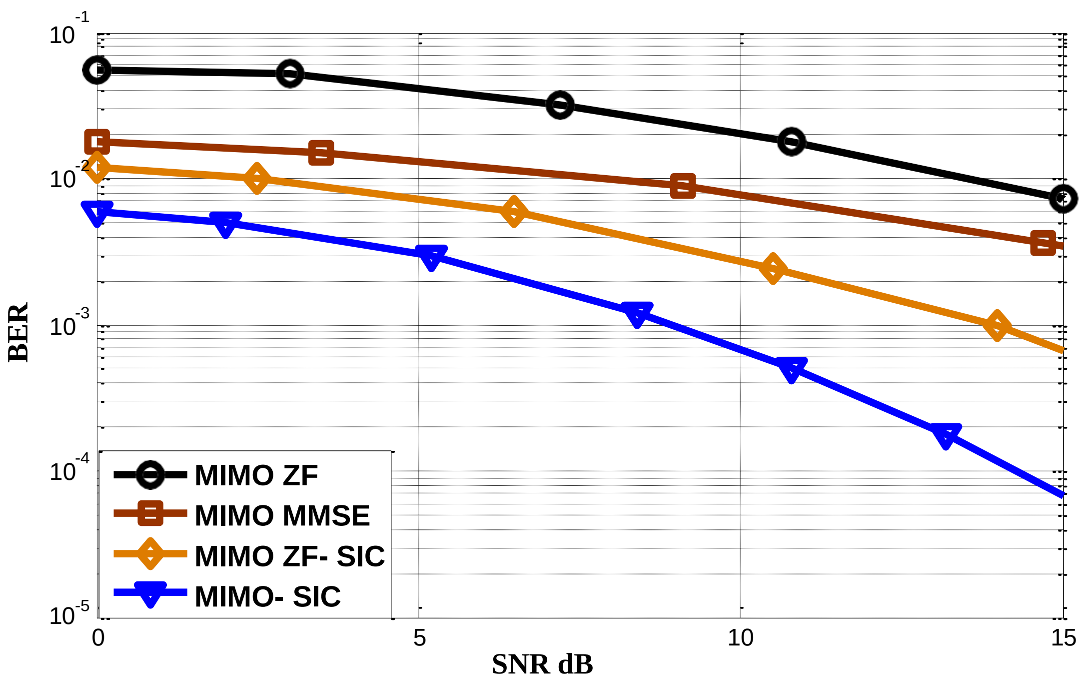

Fig. 4 SC-FDMA-DMWT Transceiver for QPSK Modulation

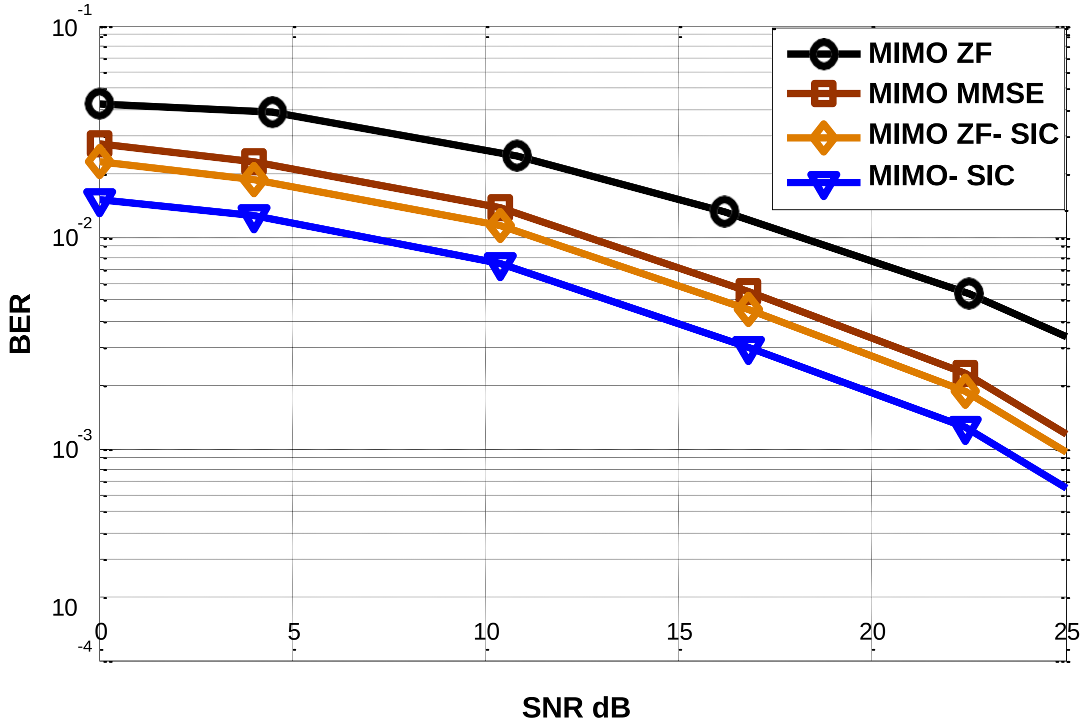

Fig. 5 SC-FDMA-DMWT Transceiver for 16 QAM Modulations

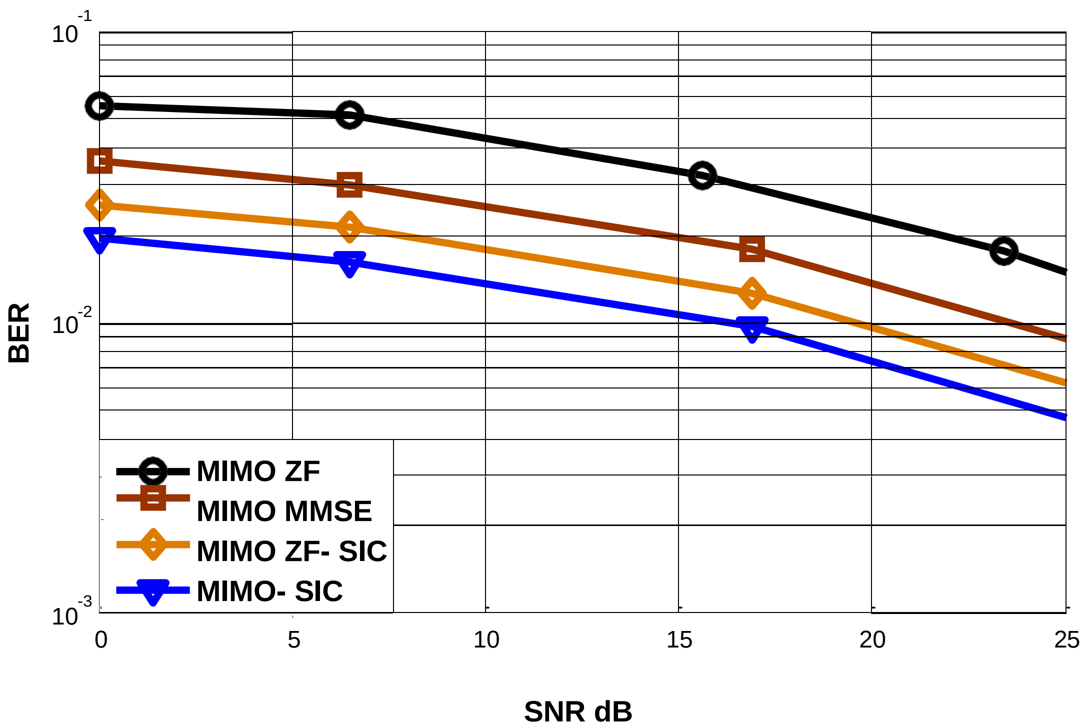

Fig. 6 SC-FDMA-DMWT Transceiver for 64 QAM Modulations

From the above results Figures we shown the SC-FDMA-DMWT Transceiver for BSPK Modulation with Minimum Mean Square Error with Successive Interference Cancellation proves to be the best method to

4. CONCLUSION

From all reproductions and cases it have the capacity to accomplish that the interleaved subcarrier mode offers lower BER than restricted mode in circumstance of SC-FDMA-DMWT Transceiver for BSPK Modulation offers preferred execution over different instances of BER tests. In circumstance of PAPR tests it has the capacity to assign that when move off factor increment from zero to one this lead to decrease the PAPR. At the point when the adjustment is variety from BPSK, QPSK to 16QAM or 64QAM then the PAPR will be greater. It can announce that the interleaved mode gives lower PAPR from conveyed and limited mode. From all instances of BER one critical truth have the capacity to be shown which SC-FDMA-DMWT Transceiver is for BSPK Modulation for all cases in recreation. That implies the proposed structure is improved from plan. At last, there is no cyclic prefix partition in the proposed plan. Along these lines, the proposed framework is further transfer speed effective. Along these lines gigantic information rate transmission is potential denied of additional data transmission, that implies the quality and size of the flag spread to client will be progressed.

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