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A Performance Enhancement in BER for OFDM System Based on Using 16-QAM Technique Using Vitarbi Coding

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ABSTRACT:
Supportive wireless communication relay network in OFDM- based systems have shown to expand performance in countless system using digital modulation techniques as a form of spatial diversity, but are not gladly available cp-operative variety for M –ary QAM OFDM based system where the best relay only participates in the relaying. In this paper we compute the error rate performance of cooperative Varity for M-ary QAM OFDM based system based with best relay selection upto 512 ary QAM based. in result bit error probability of M-ary QAM OFDM- based system with best relay selection. M-ary QAM OFDM based system with best relay selection provides higher performance and error less communication. This method improves the performance in comparison in various aspects of BER and SNR with fixed and random value of aspects of BER and SNR with fixed and random value of input applied as a function on FFT, IFFT etc. to existing when the filtering is necessary for band limited condition**.**

KEYWORDS: FFT, IFFT, QAM, OFDM etc

I. INTRODUCTION :

Pendent signals are a subset of one essential signal. Therefore OFDM is a combined result of modulation and multiplexing with better resistance to impulse noise and inter-symbol interference (ISI), low complexity and high spectral efficiency. Implementation of OFDM modulation is illustrated by the OFDM system as shown in figure 2.1. Relays are oppressed to advance performance in wireless communication systems. The advantage tags of the cooperative diversity [4,7] protocols come at the expense of a reduction in the spectral efficiency since the relays must transmit on orthogonal channels in order to avoid interfering between the source node and each other . Hence for a regular cooperative diversity network with M relaying nodes, M+1 channels are employed, bandwidth penalty. This problem of the useless use of the channel resources can be eliminated with the use of the best relay selection scheme. The best relay node only is selected to retransmit to the objective [4]. Hence, two channels only are required in this case (regardless of the number of relays). In this paper, we simulate the error rate performance in a multiple path amplify-and forward relay with best-relay selection network using orthogonal frequency division multiplexing (OFDM) Signals. Multiple-relay co-operative diversity in M-ary QAM OFDM-based systems with Best Relay Selection has better performance than the regular cooperative system.

II. SYSTEM MODEL :

The growth in the use of information networks has led to the need for new communication technique with advanced data rates. OFDM is a dominant modulation technique used to achieve a high data rate and is able to eliminate inter-symbol interference (ISI). It is computationally competent due to its use of fast Fourier transform (FFT) techniques for implementing modulation and de-modulation method. In an OFDM scheme, a huge number of orthogonal, narrowband, noisy, overlapping, sub-carriers or sub-channels, transmit in parallel, split the available in transmission bandwidth. OFDM is the modulation scheme used in new broadband communication technique, including digital television, digital audio broadcasting, ADSL and wireless LANs. It also supports digital data to be efficiently and reliably transmitted over a radio channel, even in multi-path environments [11-13]. This is achieving by realizing all the subcarriers together using the inverse fast Fourier transform (IFFT). The analysis of BER performances have suggested that OFDM is better than CDMA which is currently incorporated in most existing 3G systems [4, 5].

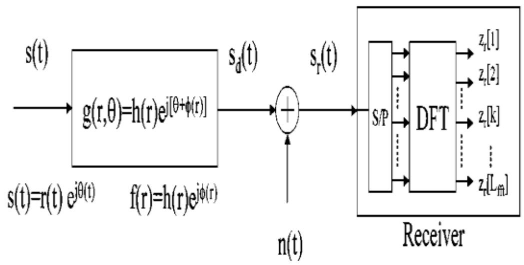

Fig. 1 Non Liner Device in AWGN Channel

A major problem in most wireless systems is the presence of a multipath channel. The transmitted signal reflects off several objectives and a result, at receiver the multipath delayed signal is occurs which causes the received signal to be distorted. In wired systems also have a same problem, reflection occurring due to impedance mismatches in the transmission line. In OFDM System the two major problems occurs in multipath channel. The first is ISI which occurs when the received OFDM symbol is distorted by the previously transmitted OFDM symbol and has a similar effect to the ISI that occurs in a single-carrier system. However, in such type of systems, the interference is typically due to several symbols other than only the previous ones; and the symbol period is typically much shorter than the time span of the channel, whereas the OFDM symbol period is much longer than the time span of the channel.

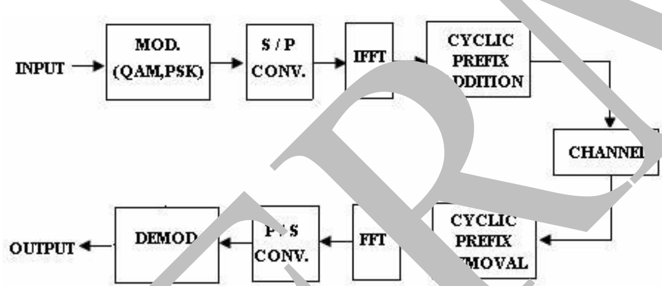

Fig. 2 Block diagram of M-ary QAM on OFDM Relay Network System.

III. PROPOSED METHODOLOGY:

IV. OFDM TRANSCEIVER In this section, we describe the OFDM transceiver system. Before transmitting information bit over an AWGN channel through the OFDM transmitter, Ithe M-PSK and M-QAM modulation schemes shown in Fig. 3.1. The transmitter section converts the digital data to be transmitted, into a map-ping of the sub-carrier's amplitude and phase using modulation techniques.

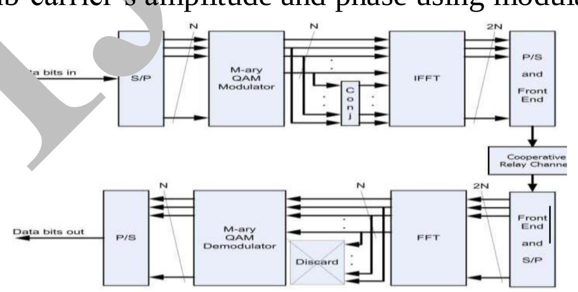

Fig. 3 Block diagram showing a basic OFDM transceiver

The spectral representation of the data is then transformed into the time domain using an IFFT which is much more computationally efficient and used in all realistic Systems. The addition of a cyclic prefix to each symbol solves both ISI and inters carrier interference (ICI). The digital data is then transmitted through the channel. After the time-domain signal passes in to the channel, it spilt into the parallel symbols and the prefix is simply unused. The receiver performs the reverse operation to that of the transmitter. The amplitude and phase of the subcarrier are then selected and changed to digital data. In OFDM, multiple sinusoidal with frequency separations 1/T are used, where T is the active symbol period. The information to be sent on each subcarrier k is multiplied by its corresponding carrier

$$g_k(t) = e^{\frac{j2\pi kt}{T}};$$

and the sum of such modulated sinusoidal forms the transmit signal. Therefore, the sinusoidal used in OFDM can be defined as [12]

$$g_k(t) = \frac{1}{\sqrt{T}} e^{\frac{j2\pi kt}{T}} w(t)$$

where, k =0, 1, ...N-1 corresponds to the frequency of the sinusoidal and w(t) =u(t)-u(t-T) is a regular window over [0, T] . Since the OFDM system uses multiple sinusoidal signals with frequency separations of 1/T, each sinusoidal is modulated by independent information. Mathematically we can write a transmit signal over the channel as,

$$\begin{aligned} S(t) &= \delta_0 g_0(t) + \delta_1 g_1(t) + \ldots + \delta_{N-1} g_{N-1}(t) \\ &= \sum_{0}^{N-1} \delta_k g_k(t) \\ &= \frac{1}{T} \sum_{0}^{N-1} \delta_k e^{\frac{j2\pi kt}{T}} w(t) \end{aligned}$$

For M=4 (QPSK):

$$P_e = \frac{1}{2} erfc\left(\sqrt{\frac{(2^{\sqrt{N}}-1)}{2^{\sqrt{N-1}}} \cdot \frac{E_b}{N_0}} \right)$$

For M=16, 64, 256,....:

$$P_e = \frac{\sqrt{M}-1}{\sqrt{M}\log_2\sqrt{M}} erfc\left(\sqrt{\frac{(2^{\sqrt{N}}-1)}{2^{\sqrt{N-1}}} \cdot \frac{3.\log_2 M.E_b}{2(M-1).N_0}} \right)$$

Where δ_k is the k th symbol in the message symbol se-quince for k in [0, N-1] ,where N is the number of carriers k.

V. SIMULATION RESULT:

Simulation was performed to measure the BER in M-ary QAM OFDM scheme. We simulated BER versus SNR for M-array OFDM into 16 sub-channels with the best-relay selection for numbers of relays (M) equal 3. All figures compares BER performance of M-array QAM OFDM Bit based and with the best-relay selection scheme, showing the results only of 256-QAM OFDM and 512 QAM OFDM modulation plots or simulations.

At BER=10-6, 4QAM-16 will require a Eb / No= 6.9 dB. 4QAM-16 with the best-relay selection will require a Eb / No= 2.05 dB. 16QAM-16 will require a Eb / No= 10.7 dB. 16QAM-16 with the best-relay selection will require a Eb / No= 6 dB. 64QAM-16 will require a Eb /No= 15 dB. 64 QAM-16 with the best-relay selection will require a Eb / No= 10.2 dB. The cooperative diversity with best-relay selection provides a performance improvement of approx 4.7 dB.

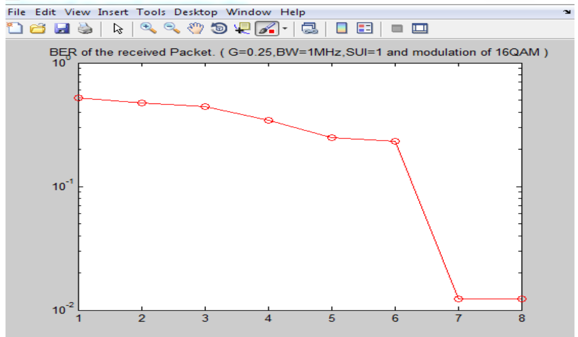

Fig 4 : BER of the Received Packet in 16 QAM

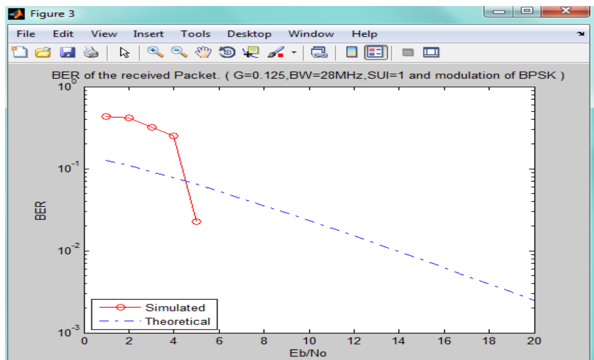

Fig 5: BER of Received Packet in BPSK

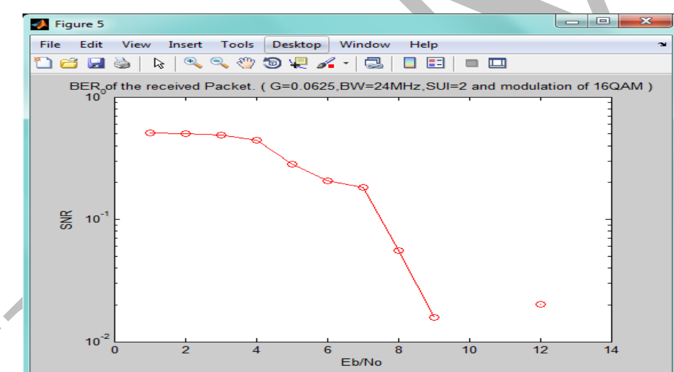

Fig. 6 BER for 16 QAM in OFDM

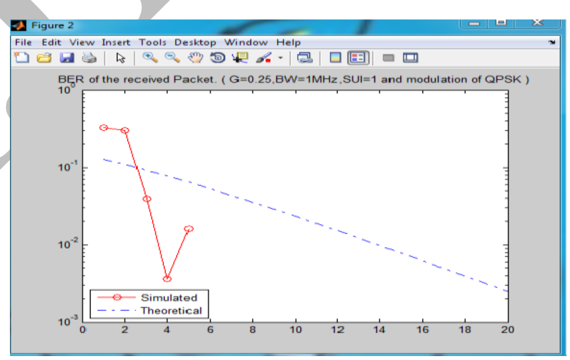

Fig.7 BER for QPSK in OFDM

COMPARISON TABLE:

1. OFDM Modulation (16QAM) **(**Pervious Work**)**

S.N.	E_b/N_0(dB)	BER
1	o	10^{-1}
2	1	$10^{-1.2}$
3	5	$10^{-1.3}$
4	10	$10^{-1.8}$

Table 1 Table for the Previous Work

2. OFDM Modulation (16QAM)

S.N.	E_b/N_0(dB)	BER
1	0	10^{-1}
2	2	$10^{-1.4}$
3	5	$10^{-1.6}$
4	10	10^{-2}

Table 2 Table for the Thesis Work

S.N.	E_b/N_0(dB)	BER
1	0	$\approx 10^{-1}$
2	2	$10^{-1.4}$
3	4	10^{-2}
4	6	$10^{-1.8}$

Table 3 Table for the Thesis Work (QPSK)

VI. FUTURE SCOPES AND CONCLUSION :

The results show M- QAM OFDM-based system with Best Relay Selection the best-relays selection cooperative has BER better than the regular cooperative diversity. The performance gain between M-ary QAM OFDM-based system with Best Relay Selection the best-relays selection cooperative and the regular cooperative diversity (irrespective of modulation scheme used) was about 0.29-0.45 dB. When we change modulation scheme for higher capacity, we can increase number of sub channel and use cooperative diversity with best-relay selection for higher performance. In this paper, we simulate only amplify and forward cooperative diversity system in the multiple paths. The sub carrier overlap is present in the OFDM but this does not create any problem since they are orthogonal, so the peak of one occurs when that of others is at zero [18]. This is achieved by realizing all the subcarriers together using the inverse fast Fourier transform (IFFT). The analysis of BER performances have suggested that OFDM is better than CDMA which is currently incorporated in most existing 3G systems [4, 5, and 19]. The major problem is resolved by using 64 QAM OFDM scheme in most wireless systems is the presence of a multipath channel and broadband services of [19] TV transmission and mobile channel operations. The transmitted signal reflects off several objectives and a result, at the receiver the multiple delayed signals are present which causes the received signal to be distorted.

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