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Subcarrier analysis power allocation for multiuser in cooperative communication using MIMO-OFDM

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ABSTRACT:-

The reduction of power consumption in co-operative multiuser OFDMA systems is a great challenge in multipath environment. The power distribution among multi users in relay path has more complexity compared with direct path. Particular subcarrier resource allocation approach that is of interest in this paper is a method based on nodes that transmit and receive on adjacent OFDM subcarriers simultaneously. This approach has shown significant promise, but its feasibility has not been fully investigated. In particular there will be a performance trade off in realistic systems as adjacent subcarriers will not be completely isolated and there will be interference on the receiving subcarriers that are adjacent to those that are transmitting. In this paper we look into the performance of such cooperative OFDMA systems under realistic conditions and relay path of cooperative communication on difference modulation on 16QAM ;64QAM;128QAM AND 256QAM using power consumptions so we propose a transceiver structure to reduce the interference between transmitting subcarriers and receiving subcarriers. . For that purpose, we will introduce a transceiver structure to reduce the interference between adjacent subcarriers. Its performance in terms of signal to interference and noise ratio (SINR) is evaluated by both analysis and simulation and is incorporated into a recently proposed cooperation strategy for OFDMA systems to examine its performance under the realistic structure.

Keywords: *- MIMO-OFDM; Subcarrier Analysis; Modulation Process; Interference Analysis and Power Consumption*

INTRODUCTION:-

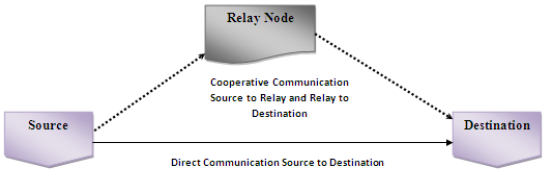
Orthogonal Frequency Division Multiplexing (OFDM) and Orthogonal Frequency Division Multiple Access (OFDMA) are two completely different variants of an equivalent broadband wireless air interface that are typically mistaken for each other. OFDMA may be a sort of OFDM, that is that the underlying

technology. The interfaces of both OFDM and OFDMA work by separating a single signal into subcarriers, or, in different words, by dividing one very quick signal into various slow signals that optimize mobile access, because the subchannels will then transmit data while not being subject to an equivalent intensity of multipath distortion long-faced by single carrier transmission. the many subcarriers square measure then collected at the receiver and recombined to create one high speed transmission. The distinction between OFDM and OFDMA is that OFDMA has the power to dynamically assign a set of those subcarriers to individual users, creating this the multi-user version of OFDM, using either Time Division Multiple Access (TDMA) (separate time frames) or Frequency Division Multiple Access (FDMA) (separate channels) for multiple users. OFDMA at the same time supports multiple users by assignment them specific subchannels for intervals of your time. Point-to-point systems square measure OFDM, and don't support OFDMA. Point-to-multipoint fastened and mobile systems use OFDMA. alittle body of analysis has already projected numerous sub-carrier primarily based duplexing schemes [13]-[17].Although subcarrier primarily based duplexing seems doable in ideal OFDM systems, the orthogonality between completely different subcarriers is lost in realistic communication systems attributable to the non-ideal characteristics of various subsystems (e.g., frequency offset of oscillator, nonlinearity of power amplifier, etc.) and these effects have to be compelled to be addressed to know however the transmittal subcarriers can interfere with neighboring receiving subcarriers. To perform this we have a tendency to build use of a transceiver structure that utilizes baseband echo cancellation to suppress the interference between the transmitting and receiving subcarriers. The performance of this transceiver is verified by analysis and technique. This theme is then incorporated into the cooperation strategy of [10] to research its performance underneath realistic conditions. it's discovered that though the performance of the cooperative network is degraded attributable to the residual interference obligatory on the receiving subcarriers by the transmittal subcarriers, it still performs higher compared with typical cooperation schemes.

Cooperative Communication:-

Wireless communication that is most useful in terms of mobile access is presently a extremely demanded

communication technology. it's saw many organic process phases since its origination in order that it will meet to the ever dynamic desires of its wide selection of applications [18]. the most important challenges within the history of wireless communications that has induced goodly analysis for doable solutions are the multipath fading, shadowing and path loss effects of wireless channel [22].



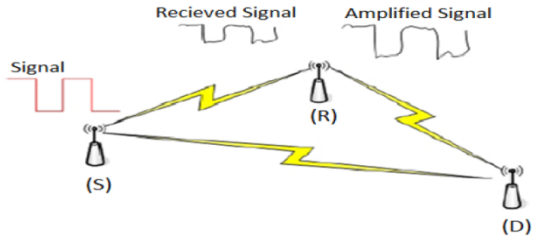
Random variations of channel quality in time, frequency and area square measure caused by these effects. the strategy that involves the employment of one all purpose device to deploy network services leads to style complications that lead to inefficient use of battery power inflicting short battery life [24]. Users will ease off the load on the network and successively increase the capability and battery life for his or her devices by cooperative communications in such things.

This technique that was supported the analysis of the capability of a three- node network consisting of a supply, a relay and a receiver has the idea that each one nodes operate within the same band. thus the system may well be rotten into a broadcast channel with relevance the supply and a multipath access channel with relevance the destination. The relays whole and sole purpose is to assist main channel, within the work on the relay channel however in cooperative communication, he total system resources square measure fastened, and users act each as data sources and as relays. In spite of sure thing of the historical importance of the primary work on relay channel, recent add cooperation has taken a somewhat totally different stress. To modify cooperation among users, totally different relaying techniques may well be used depending on the relative user location, channel conditions, and transceiver quality. These square measure strategies that outline however information is processed at the relays before onward transmission to the destination. There square measure differing kinds of cooperative communication methods which might be printed. These embrace the Amplify and Forward (AAF) and rewrite and Forward

Amplify-and-forward strategy (AAF)

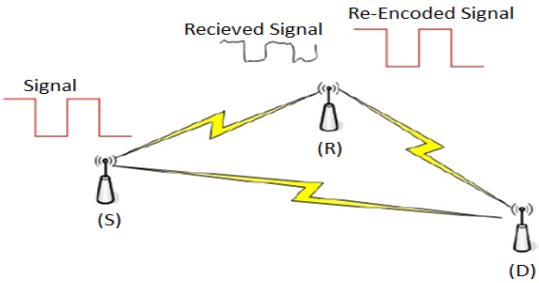
This is an easy cooperative signalling technique wherever every user receives a loud version of the signal transmitted by its partner amplifies it and retransmits to the bottom station. the bottom receives 2 severally light versions of the signal and combines **them so as to form better**

choices on data detection.



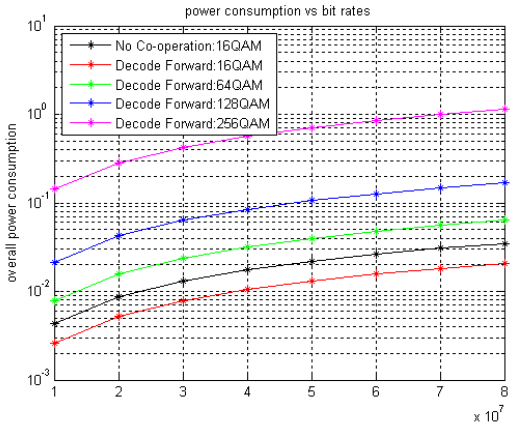
Decode-and-forward strategy (DAF)

This strategy follows that the relay station decodes the received signal from the source node, re-encodes it and forwards it to the destination station. It is the most often preferred method to process data in the relay since there is no amplified noise in the signal sent [20]. Again, consider the case of a single relay. The simplest algorithm described below again divides transmissions into two blocks of equal duration, one block for the source transmission and one block for the relay transmission. For the simplest algorithm, the source transmits Xs[k] for k = 1, 2, n.



Performance of the proposed transceiver for echo cancellation

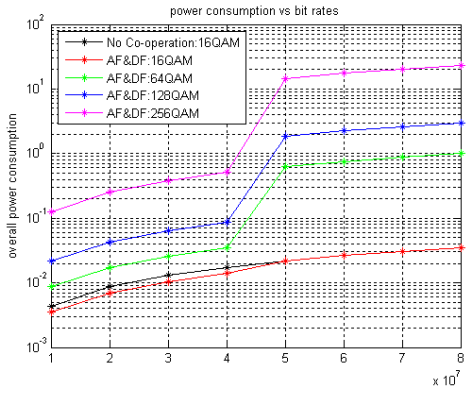
In principle, the SI waveform can be perfectly regenerated at the receiver since the transmit data is known inside the device. Thus, again in principle, SI can be perfectly cancelled in the receiver path.



The orthogonality between subcarriers is partially lost in OFDM systems due to the non-ideal characteristics of different subsystems (e.g., nonlinearity of power amplifier, frequency offset of local oscillator etc.), resulting in signal leakage between subcarriers or inter-carrier interference (ICI). When a user is operating in subcarrier-based duplexing mode, due to the enormous difference in the power of the transmitting signal and desired signal, the effect of ICI on the receiving Sub-carriers could be significant. The subsystem imperfections that are important to consider include carrier frequency offset (CFO), time synchronization, quantization error of Analogy/Digital Converter (ADC), nonlinearity of Power Amplifier (PA), I/Q imbalance and Phase Noise of Local Oscillator (LO).

AF and DF Relay Path on Cooperative Communication:-

AF and DF aforementioned are often called fixed cooperation modes because the relay node always participates in cooperative communication no matter what the channel transmission characteristics are. As a matter of fact, cooperation does not always bring benefits. For example, in a half duplex mode, the data transmission rate and the utilization of the degrees of freedom will decrease. This indicates when to cooperate is a critical issue.



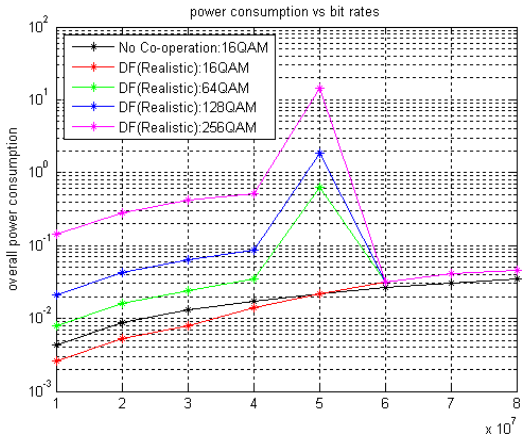
Only when the characteristic value is greater than the threshold, cooperative communication is implemented; otherwise, the source node direct transmission again. Hence, the key in selection modes is the conditions of source-relay channel. In incremental modes, the feedback of the destination node is used to determine whether the direct transmission is successful. If the data are correctly detected, source node will send new data; otherwise, the relay node will participate in the cooperative communication process. This process is equivalent to adding redundancy mechanism or automatic detection and retransmission mechanism in the relay transmission.

$$\mathrm{SNR}_{1,\mathrm{MRC}} = \frac{\left(|\mathbf{h}_{11}^H \mathbf{w}_1| + |\mathbf{h}_{12}^H \mathbf{w}_3|\right)^2 \cdot \mathrm{E}(s_1 s_1^*)}{\sigma_{\mathrm{MS}}^2},$$

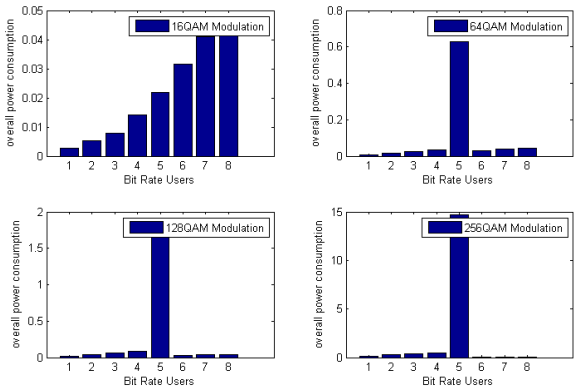
$$\mathrm{SNR}_{2,\mathrm{MRC}} = \frac{\left(|\mathbf{h}_{21}^H \mathbf{w}_2| + |\mathbf{h}_{22}^H \mathbf{w}_4|\right)^2 \cdot \mathrm{E}(s_2 s_2^*)}{\sigma_{\mathrm{MS}}^2}.$$

RESULT Analysis:-

In order to align the phases of the received signals, we need phase synchronization between the relays, i.e., the two relays require a global phase reference. The cooperative MRC scheme serves two users at the same time and has full rate transmission for each receiver. This is achieved without using additional resources or exchanging channel knowledge and data between different relays.



From this graph we have observed that the transmission bit rate is increased and power consumption reduced by increasing the levels of QAM modulation techniques as 64-QAM, 128-QAM and 256- QAM modulations. In each level of QAM modulation we have achieved the decrement in power consumption for the DF cooperation under realistic conditions compared with the non cooperative condition. By using above comparison we investigated the sub carrier based duplexing in terms of different QAM modulation techniques performance of cooperative communication OFDMA systems with BER can play an important role to decrease the power consumption.



CONCLUSION:-

Cooperative communication in OFDMA systems has been shown to significantly improve wireless system performance. In this project a particular subcarrier resource allocation approach investigated. To perform the investigation we proposed a transceiver structure so that the system tradeoffs and limitations of this approach could be understood. The performance of the transceiver was evaluated by both analysis and computer simulation and it was shown that the non-ideal characteristics of subsystems will limit the achievable SINR. From this observation, we obtained a good improvement in reduction of power consumption particularly in relay network. To achieve this, we use different levels of QAM modulations (16- QAM, 64-QAM, 128-QAM and 256). By using these levels of QAM, we improved the data rates and decrease the bit error rates. Finally, we compared all these results by computer simulations.

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