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An Experiment Analysis report of COFDM for Improving Efficiency to Transmit different type of file through Modulation Techniques

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A B S T R A C T

In The current eraany technologies has been widely used in wireless4G system, But today our demand on 5G system wireless transmitter and receiver which will be used in communication. In this paper we presents novel method for used maximum spectral efficiency from Coded Orthogonal Frequency Division Multiplexing (COFDM) system,and simulate for the transmissionof different different data file for sending and receiving. After completing all case we analysis the result obtained from simulation of our algorithm which are presented in different-different parameter and plotted their result in table form and also in figure. In statistics, for any zero-mean random stationary signal, the RMS value is same as the standard deviation of the signal. Presented in table 3 and graph potted in figure 13. Delay spread of a multipath channel is often calculated as the RMS value of the Power Delay Profile (PDP). The peak to RMS, Root Mean Square (RMS) value is the most important parameter that signifies the size of a signal root of their individual Peak to RMS values of case 4 which is presented in graph yellow line, and we identify that in all type of file its vale become nearly constant but in RAR type of file its RMS value become very less which is 0.16924 show in table 3 and figure 14 in case 4 and in other case RMS value is little differed. In case 1 with image type of file RMS become very high which is 0.21714.These techniques utilize the knowledge of the radio channel response, to optimize the frequency, and subcarrier modulation. one possible crucial problem in receiver side where receiver may require a very large memory range in order to handle the large signal strength variation between Tx and Rx. For the maximum spectral efficiency from Orthogonal Frequency Division Multiplexing (COFDM) systems.

Keywords: Orthogonal Frequency Division Multiplexing (OFDM) systems, Subcarrier,Bit Error Rate (BER), Additive White Gaussian Noise (AWGN), frequency.

1. Introduction

In this paper try to investigates the effectiveness of Orthogonal Frequency Division Multiplexing (OFDM) as a modulation technique for wireless radio applications. In terms of the equipment to be used the high peak to average ratio of multi-carrier systems such as OFDM requires the RF final amplifier on the output of the transmitter to be able to handle the peaks whilst the average power is much lower and this leads to inefficiency. In some systems the peaks are limited. Although this introduces distortion that results in a higher level of data errors, the system can rely on the error correction to remove them.

In this investigates the effectiveness of OFDM as a modulation technique for wireless radio applications. The main aim was to assess the suitability of OFDM as a modulation technique for a fixed wireless phone system for rural areas of Asia. The mobile technology is becoming an integral part as it is accessible almost everywhere in the globe. Mobile computing has been in the past few many years forming a new computing environment. The fact that mobile computing is constrained by poor resources, highly dynamic variable connectivity and restricted energy sources, the design of stable and efficient mobile information systems has been greatly complicated. However, its suitability for more general wireless applications is also assessed.

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One method of reducing the high in Fra structure cost of a wired system is to use a fixed wireless radio network. The telecommunications industry faces the problem of providing telephone services to rural areas, where the customer base is small, but the cost of installing a wired phone network is very high. The problem with this is that for rural and urban areas, large cell sizes are required to obtain sufficient coverage. Results in problems caused by big signal path loss and long delay times in multipath signal propagation.

Currently Global System for Mobile telecommunications (GSM) technology is being applied to fixed wireless phone systems in rural areas. However, GSM uses Time Division Multiple Access (TDMA), which has a high symbol rate leading to problems with multipath causing inter-symbol interference.

Unipolar OFDM (U-OFDM) [1], Flip-OFDM [2], these methods adventure the possessions of the fast Fourier transform (FFT) and the possessions of the OFDM frame construction in order to realize a unipolar signal without biasing. It is interesting to note that the underlying concepts presented for U-OFDM. It is also stimulating to note that methods attain the same presentation in an additive white Gaussian noise (AWGN) channel [3]. Aimed at the same modulation order, the spectral competence of each of these methods is halved when associated to DCO-OFDM. But, the power penalty when associated to a bipolar OFDM signal is merely 3 dB for any M-QAM group size, which amounts to a significant energy benefit over DCO-OFDM. Better-quality decoders, which are equivalent in presentation, have been industrialized for ACOOFDM [4], U-OFDM and Flip-OFDM. Even however, to the best of the authors' knowledge, such a better-quality decoder is not obtainable in the literature for PAM-DMT, it would be forthright to design. The better-quality decoders make the power efficiency of systems almost equal to the case for a bipolar OFDM signal nonetheless can only work for a comparatively flat communication channel. The real problem, however, stems from the reduced spectral efficiency, which needs M-QAM DCO-OFDM to be associated to M2-QAM ACOOFDM/ U-OFDM/Flip-OFDM and to M-PAM PAM-DMT in instruction to keep the attainable data rate equivalent. This reasons a substantial damage of energy efficiency associated to DCOOFDM in schemes for a spectral efficiency overhead 1 bit/s/Hz [5]. To simultaneously communicate ACO-OFDM and DCO-OFDM in an effort to nearby the spectral productivity gap [6]. The bias levels for the different realizations of DCO-OFDM are optimized through Monte Carlo simulations, in agreement with earlier works such as [7].

Several techniques are under consideration for the next generation of digital phone systems, with the aim of improving cell capacity, multipath immunity, and flexibility. These include CDMA and Coded OFDM. Both these techniques could be applied to providing a fixed wireless system for rural areas. However, each technique has different properties, making it more suited for specific applications.

2. Related Work

This paper proposes [8] comparative performance analysis of QAM techniques as used in DVBT2 applied to random data base and also to images. Methods/Statistical Analysis: The proposed work uses MATLAB as the basic tool and applies DVBT2 techniques using 16 QAM and 64 QAM modulation techniques. The analysis is about observing the effect of increment in SNR on the corresponding BER. In case of image, the same has been verified visually by seeing the quality of reconstruction. Findings: The BER achieved is decreasing for an incremented value of SNR and there is a very well observed trade-off between these two, when 16 QAM and 64 QAM are applied in DVBT2. Also, it can be seen that images are better reconstructed in case when SNR is just little more than. Improvements: Dropping the probably less efficient 4 QAM, the potentially better 16 and 64 QAM is being targeted and results are obtained.

OFDM is a multicarrier transmission technique, it divide spectrum with many carriers, each one being modulated by a low rate data stream. OFDM is similar to FDMA in that the multiple user access is achieved by subdividing the bandwidth into multiple channels that are allocated to users. However, OFDM spectrum much more efficiently by spacing the channels much closer together [9]. This is achieved by the making all carriers orthogonal to the one another, preventing interference between the closely spaced carriers.

In their paper, author say the evaluated BER performance of an OFDM system with two digital modulation schemes, namely M-ary PSK and M-ary QAM, over an AWGN channel. OFDM is a powerful modulation technique to achieve high data rate and is able to eliminate ISI. It is computationally efficient due to its use of FFT techniques for implementing modulation and demodulation functions. It is observed from the M-ary PSK BER plots that the BER is less in the case of 4-PSK for a low Eb/N0 than in the 8- PSK and 16-PSK cases. Hence, as a higher value of M-ary PSK increases spectrum efficiency, but is easily affected by noise, the OFDM system with the higher M-PSK scheme is used for large-capacity, long-distance application at the cost of slight increase in Eb/N0 while that with the QPSK scheme is suitable for low-capacity, short-distance application.

In this research paper [10] authors propose and experimentally demonstrate one novel scheme to improve the performance of the vector millimeter-wave (mm-wave) signal generated by intensity modulator based on optical carrier suppression. The phase distribution of the vector mm-wave signal after one square-law photodiode detection becomes non-uniform. They optimize the phase factor at the transmitter side and make the phase distribution of the quadrature phase-shift keying signal to be symmetrical at the receiver.

In this research paper [11] authors demonstrate all-optical regeneration of both the phase and the amplitude of a 10 GBaud QPSK signal using two nonlinear stages. First they regenerate the phase using a wavelength converting phase sensitive amplifier and then they regenerate the amplitude using a saturated single-pump parametric amplifier, returning the signal to its original wavelength at the same time. Author exploit the conjugating nature of the two processing stages to eliminate the intrinsic SPM distortion of the system, further improving performance.

In this research articles authors [12] experimentally demonstrate on-chip mode-selective wavelength conversions based on the degenerate four-wave mixing (FWM) nonlinear effect in a few-mode silicon waveguide. A multimode waveguide with tapered directional coupler based mode (de)multiplexers is designed and fabricated. Using signals with advanced modulation formats all-optical wavelength conversions of 102.6-Gb/s OFDM-QPSK signals are verified. Experimental results show that only small optical signal-to-noise ratio (OSNR) penalties are observed after wavelength conversion of both modes, which are less than 2 dB for OFDMQPSK at 7% forward error correction (FEC) threshold.

In their article they reviews the literature on the architectures of the COOFDM optical transport network and discusses key issues, particularly involving network control plane, light path routing and spectrum assignment, impact of channel modulation format and optical reach, sub wavelength traffic grooming, network survivability, and network reconfiguration.

The comparison of M-ary PSK and M-ary QAM schemes indicate that, the BER is large in M-PSK as compared to M-QAM and it is generally depending on its applications. For a higher value of M, such as $M > 16$, the QAM modulation scheme is suitable for OFDM. In both cases, author obtain good performances but of these two modulation schemes author conclude that for a high capacity data rate transmission M-ary QAM modulation is better than the M-ary PSK modulation.

Table 1. Show Configuration setting for simulation of transmitting different different data sets in case 4.In this given configuration some of the setting and its value change error rate when fully debugged. If the receiver is giving to the very high error rates, then it is clear that there is a synchronisation error. For fix the error used the different value in given variable ifft_size, guardtime and NumCarr.

3. Generation of COFDM

For successfully generate of COFDM with the relationship between all the carriers must becarefully controlled to maintain the orthogonality of the carriers. Each carrier to be produced and is assigned to the somedata to be the transmit. The required amplitude and phase of the carrier is calculatedwith the based on the modulation scheme (typically differential BPSK, QPSK, or QAM). Therequired spectrum is converted back to it's the time domain signal using an InverseFourier Transform. The performances of IFFT transformation is very efficiently, and its provides asimple way of ensuring that the the carrier signals produced are orthogonal.

OFDM signals are characteristically generated digitally due to the trouble in creating large banks of phase locks oscillators and receivers in the analog domain. Figure 24 shows the Flow Chart of a classic OFDM transceiver.

Stage 1. The transmitter section converts digital data to be transmitted,into a mapping of subcarrier amplitude and phase.

Stage 2. Transforms this spectral representationof the data into the time domain using an Inverse Discrete Fourier Transform (IDFT).

Stage 3. TheInverse Fast Fourier Transform (IFFT) achieves the same actions as an IDFT, excluding that it ismuch more computationally effectiveness, and so is used in all practical systems.

Stage 4. Calculated time domain signal,in order totransmit the OFDM signal then mixed up to the requiredfrequency.

Stage 5. The receiver completes the reverse action of the transmitter, mixing the RF signal to base bandfor processing, then consuming a Fast Fourier Transform (FFT) to analyze the signal in the frequency domain.

Stage 6. The amplitude and phase of the sub carriers is then picked out and transformed backto digital data.

Stage 7. The IFFT and the FFT are harmonizing function and the maximum appropriate termbe contingent on whether the signal is actuality received or generated.

Stage 8. Belongings where the signal isself-governing of this dissimilarity then the term FFT and IFFT is used interchangeably.

The Fast Fourier Transform (FFT) transforms a cyclic time domain signal into the equivalent frequency spectrum. The amplitude andphase of the sinusoidal components represent the frequency spectrum of timedomain signal. The IFFT performs are reverse process, to transform a spectrum(amplitude and phase of the each component) into a time domain signal. Each data point in frequencyspectrum used for an FFT or IFFT is called a bin. The orthogonal carriers required forCOFDM signal and its can be easily generated bythe setting of amplitude and phase of each bin, then an IFFT performing.

4. Experiments and Results

In this paper In our experiment we are taken four different case in which we change some few parameter for analysis of our algorithm. After analysis we found our case 4 is give best result. But we identify that time signal of every type of file and cases were frequency losses less signal and RMS signal ratio become very less. In figure 14 show that time signal of transmitted wave file for especially for case 4 where we transmitted only an audio file.

For Improving Efficiency through Modulation Technique for Wireless Communication Problem.

Table 1 Case 4, configuration for simulation of COFDM

S. No	Description	Variable	Value
1	Size Fourier Transform To Generate Signal	IFFTSIZE	1024
2	Number Of Transmission Carriers	NUMCARR	48
3	Total Guard Time In Samples	GUARDTIME	512
4	Number Of Data Symbols Per Frame	SYMBPERFRA ME	256

After running of Case 4 using configuration of Table 1, with different-different type of file which are Audio, Docx, HTML, PDF, RAR, Image, XLSX and ZIP. Experimental result are given in Table 3 for analysis then and comparing with other Cases and protocols.

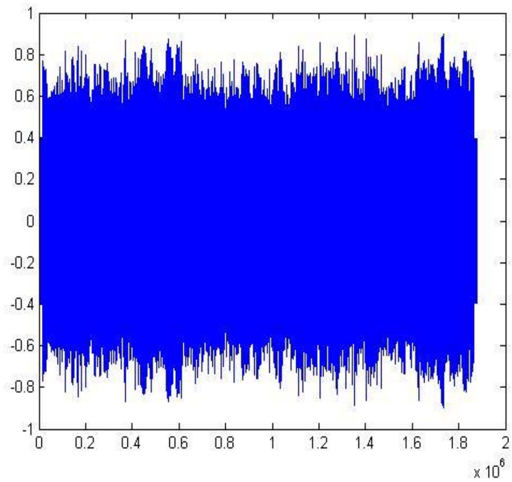

Figure 2 Time Signal of Transmitted Wave file for Case 4 of Audio Data.

Not only for transmitted data also we capture for before decoded an audio file and time signal were plotted in figure 2. Again we repeated this case for MS Word file where identify that some frequency are missing from figure which is show in figure 3. Time signal of transmitted wave file for especially for case 4 of MS Word type file and its extension is Docx, And Not only for transmitted data also we capture for before decoded Docx file.

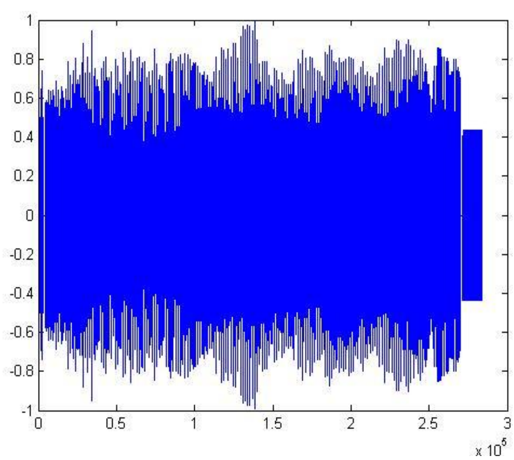

Figure 1 Time Signal of Wav file for Case 4 of Audio before decoded frame.

Same are repeated for RAR type of file were gives time signal graph of RAR type file transmitted after and before decoded it. Show in figure 5.

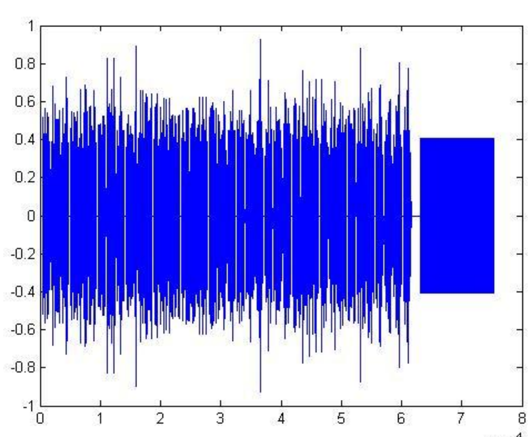

Figure 4 Time Signal of Wave file for Case 4 of Docx before decoded frame.

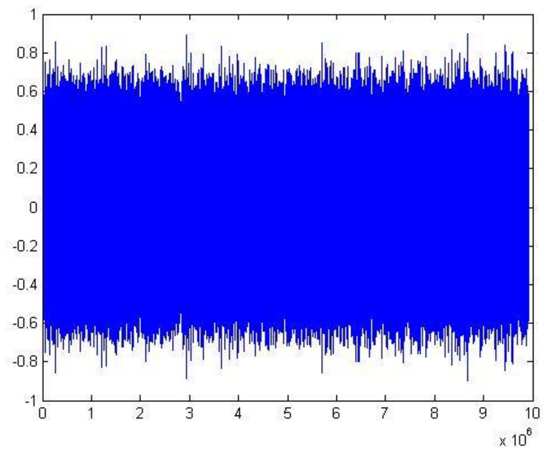

Figure 5 Time Signal of Transmitted Wave file for Case 4 of RAR Data.

Here one think we noted that when we do experiment for transmitted of an image file from one location to another location by using our algorithm.

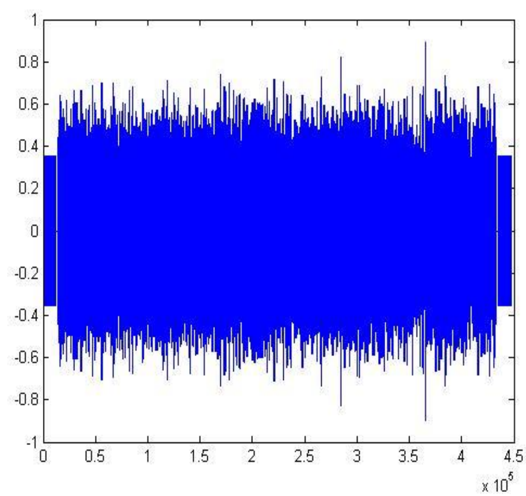

Figure 6 Time Signal of Transmitted Wave file for Case 4 of Image Data.

We catch that time signal wave file of an image base data the plotted graph show some different pattern of frequency and also BER will increased in number, Error in frame decoded and many more thinks. Which are plotted in figure 8 and figure 9.

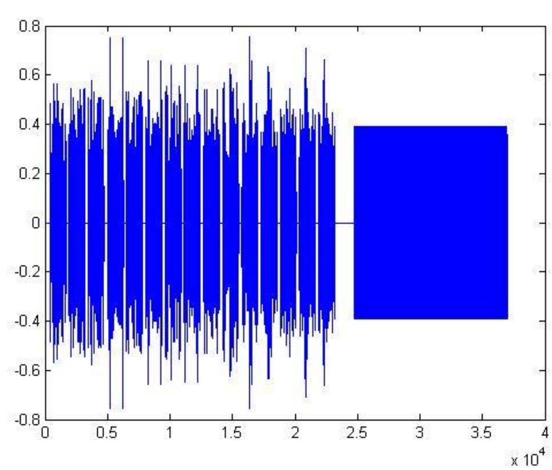

Figure 7 Time Signal of Wav file for Case 4 of Image before decoded frame.

From this given parameter of table 1 we received best result with error of 5829 but we recognize that our transmitter signal size goes high up to 15mb. From this the current status of COFDM research appears a suitable technique of modulation for high performance wireless telecommunications. Here one possible problem is receiver may require a large memory range in order to handle the large signal strength variation between users.

Table 2 Show results from simulation of transmitting an imageWith 11,878 bytes in 120*90

S. No.	Fields	Value
1	Max Signal Level	0.95
2	RMS Signal Level	0.20472
3	Peak to RMS power ratio	13.331dB
4	Total Time (Tx)	2.095sec
5	Total FLOPS (Tx)	0
6	Process Speed (Tx)	0 flops/sec
7	BER	0.53972
8	RMS phase error	1.139
9	Total number of errors	5829
10	Total No. Decoding Frame	14
11	SNR of the (Rx)	12.0438 dB
12	Total Time (Rx)	9.4415sec
13	Total FLOPS (Rx)	0
14	Process Speed (Rx)	0 flops/sec

From this experiment it is clear that, this receiver have a very high synchronisation error rates, then it is clear that there is a synchronisation error. For fix the error used the different value in given variable ifft_size, guardtime and NumCarr.This experimental analysis show the simulation result of the transmitted a tiger image of size of 11,878 bytes in 120*90.

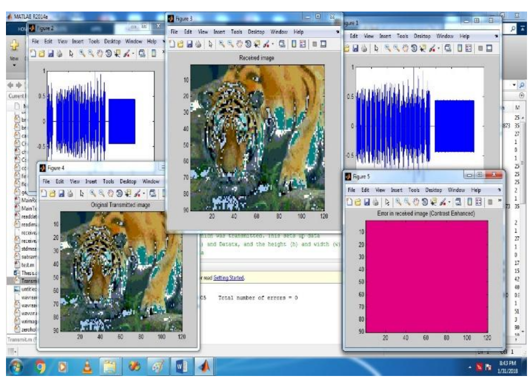

Figure 8 Screen shot of our simulation program

This research of tiger images is concentrated on COFDM, however most practical system would use forward error correction to improve the system performance. Here in more work are done on studying forward error correction to improved performance that would be suitable for different applications, like data transmission.

Figure 9 Original Image send by given Parameter to transmitted by COFDM

In Some research papers practical tests performed on a low bandwidth baseband signal. But in this research we try a high signal range so our transmitted (Tx) file become more heavy.

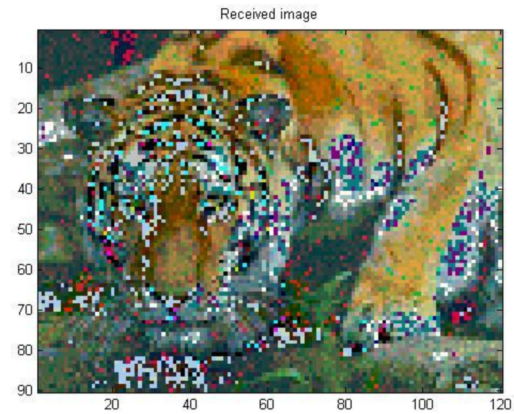

Figure 10 Received Image trough receiver by given Parameter

So far only some main performance criteria have been tested, those are COFDM's tolerance to multipath delay spread, peak power clipping and channel noise. These includes effect of frequency stability errors on impulse noise effects and COFDM show in figure 11, figure 12 show Time Signal of Original Image send by given Parameter to transmit and figure 3.16 Frequency of Original Image send by given Parameter to transmit.

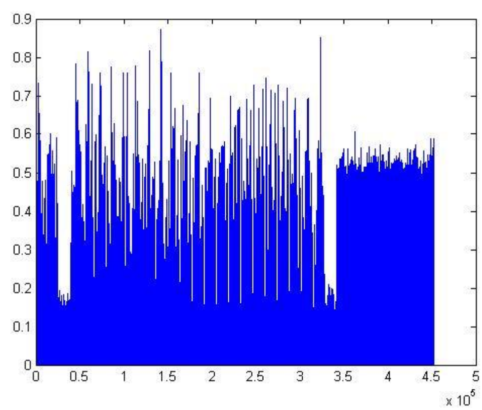

Figure 11 Frequency of Original Image send to transmit by COFDM.

In figure 11 show Received Error when Tx and Rxdata by given Parameter. Some modulation techniques for COFDM is investigated. From this system performance gains may be possible by dynamically choosing the modulation technique based on the type of data being transmitted.

Here we simulate separately image file because we getting different result on it, finally we also taken different type of file for transmission and receiving it without error bit.

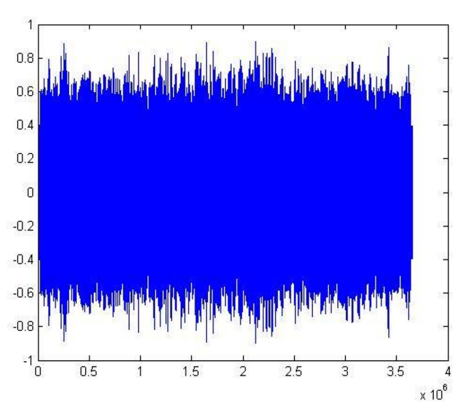

Figure 12 Time Signal of Original Image send and transmit by COFDM.

After completing all case we analysis the result obtained from simulation of our algorithm which are presented in different-different parameter and plotted their result in table form and also in figure. In statistics, for any zero-mean random stationary signal, the RMS value is same as the standard deviation of the signal. Presented in table 3 and graph potted in figure 13. Delay spread of a multipath channel is often calculated as the RMS value of the Power Delay Profile (PDP). Also when two uncorrelated (or orthogonal) signals are added together, such as noise from two independent sources, the RMS value of their sum is equal to the square-root of sum of the square of their individual RMS values.

Table 3 Show RMS Signal Level from simulation result.

S. No.	File Type	Case-1	Case-2	Case-3	Case-4
1	Audio	0.20249	0.19728	0.19321	0.19718
2	DOCX	0.20354	0.2051	0.1908	0.18674
3	HTML	0.19662	0.18496	0.20376	0.19224
4	PDF	0.19558	0.19372	0.2037	0.18767
5	RAR	0.18486	0.17953	0.17798	0.16924
6	Image	0.21714	0.19657	0.21716	0.176
7	XLSX	0.20343	0.20109	0.20233	0.1842
8	ZIP	0.16583	0.18904	0.18505	0.17938

The peak to RMS, Root Mean Square (RMS) value is the most important parameter that signifies the size of a signal root of their individual Peak to RMS values of case 4 which is presented in graph yellow line, and we identify that in all type of file its vale become nearly constant but in RAR type of file its RMS value become very less which is 0.16924 show in table 3 and figure 14 in case 4 and in other case RMS value is little differed. In case 1 with image type of file RMS become very high which is 0.21714.

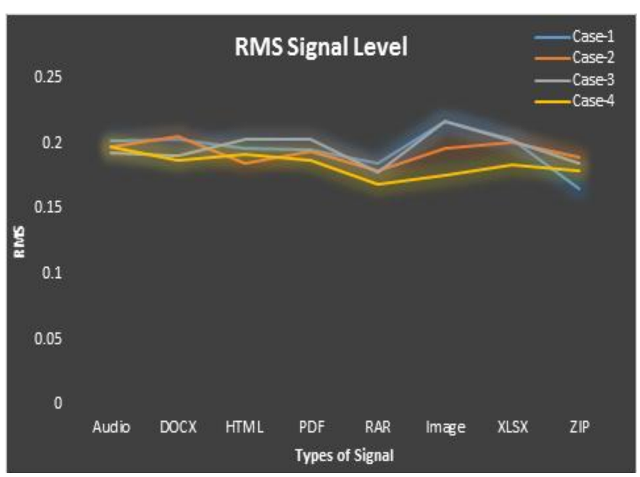

Figure 13 Show RMS Signal Level from simulation result in graph.

The square-root of sum of the square of their individual Peak RMS values of case 4 which is presented in graph yellow line, and we identify that in all type of file its value become nearly constant but in RAR type of file its RMS value become very high which is 14.5148 in case 4 and in other case Peak to RMS value is little varied. In case 1 with image type of file RMS become very low that is 12.3502 show in table 4 and figure 13.

Table 4 Peak to RMS power ratio dB.

S.No.	File Type	Case-1	Case-2	Case-3	Case-4
1	Audio	12.9567	13.1832	13.3684	13.1874
2	DOCX	12.912	12.8456	13.4732	13.6599
3	HTML	13.2124	13.7432	12.9027	13.408
4	PDF	13.2585	13.3414	12.9052	13.6168
5	RAR	13.7482	14.0023	14.0775	14.5148
6	Image	12.3502	13.2147	12.3494	14.1746
7	XLSX	12.9165	13.0172	12.9635	13.7789
8	ZIP	14.6918	13.5538	13.7389	14.0093

Transfer data is not normally sent at a uniform rate through a channel. In its place, there is frequently a burst of regularly spaced binary data bits tracked by a pause, after which the data streaming will resumes. Packets of data are sent in the manner, probably with variable-length pauses between packets, until the data has been fully transmitted. Two basic methods are employed to guarantee correct synchronization.

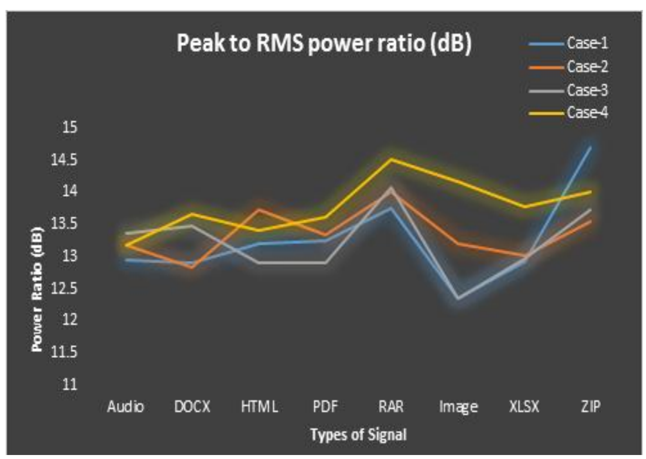

Figure 14 Peak to RMS power ratio dB in graph.

In synchronous systems, separate channels are used to transmit data and timing information. The timing channel transmits clock pulses to the receiver. Upon receipt of a clock pulse, the receiver reads the data channel and latches the bit value found on the channel at that moment. The data channel is not read again until the next clock pulse arrives. Because the transmitter originates both the data and the timing pulses, the receiver will read the data channel only when told to do so by the transmitter (via the clock pulse), and synchronization is guaranteed.

5. Conclusion

After completing all case we analysis the result obtained from simulation of our algorithm which are presented in different-different parameter and plotted their result in table form and also in figure. In statistics, for any zero-mean random stationary signal, the RMS value is same as the standard deviation of the signal. Presented in table 3 and graph potted in figure 13. Delay spread of a multipath channel is often calculated as the RMS value of the Power Delay Profile (PDP). Also when two uncorrelated (or orthogonal) signals are added together, such as noise from two independent sources, the RMS value of their sum is equal to the square-root of sum of the square of their individual RMS values.From this the current status of COFDM research appears a suitable technique of modulation for high performance wireless telecommunications.Despite the increasing attention and considerable progress. This article reviews the literature on the architectures of the COOFDM optical transport network, light path routing, sub wavelength traffic grooming, network survivability, and network reconfiguration.

The peak to RMS, Root Mean Square (RMS) value is the most important parameter that signifies the size of a signal root of their individual Peak to RMS values of case 4 which is presented in graph yellow line, and we identify that in all type of file its vale become nearly constant but in RAR type of file its RMS value become very less which is 0.16924 show in table 3 and figure 14 in case 4 and in other case RMS value is little differed. In case 1 with image type of file RMS become very high which is 0.21714.

The coherent optical orthogonal frequency-division multiplexing (COOFDM) optical transport network. It employs the promising COOFDM transmission technique. The COOFDM optical transport network is characterized by arbitrarily assigning center frequency and bandwidth of an optical channel, thereby providing flexibility in network design and operation which achieving efficient fiber spectrum utilization.. For the maximum spectral efficiency from Orthogonal Frequency Division Multiplexing (OFDM) systems.

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