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A Comprehensive Review-Parr Reduction Techniques OFDM Technology

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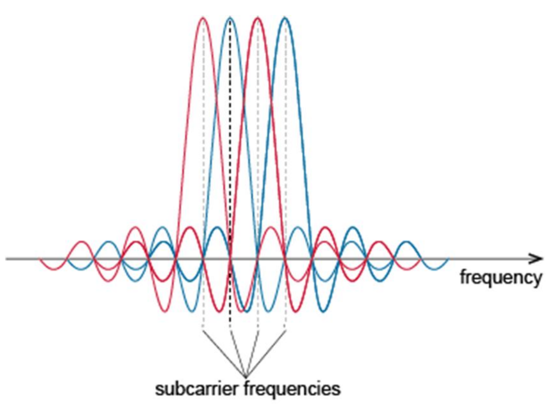
Abstract: The major challenge in multicarrier transmission is peak average power (PAPR). The OFDM suffers from the problem of high PAPR where PAPR is the ration of maximum power in a signal to the average power of any signal. Such kind of problem is more significant as the efficiency of such systems is limited by the power source. Signals, previously transmitted in the analog environment, are now gradually being received in the physical world. To efficient reception, multi-carriers substitute only single-carrier waves. Multi-carrier structures such as CDMA and OFDM are now-a-widely deployed days. The orthogonally positioned sub – carriers are used in the OFDM framework to move data from the end of the transmitter to the end of the receiver. Throughout this method, the existence of guard band solves the issue of ISI and noise is reduced by a greater number of sub-carriers. Yet this signal's broad Peak–to– Mean Power Ratio has certain adverse device consequences.
Keywords: Orthogonal Frequency Division Multiplexing (OFDM), OFDM System Model, OFDM Transceiver, Peak–to– Mean Power Ratio, PAPR.

I. INTRODUCTION

In the era of technical advent, the mobile communication is increasing day by day so as the volume of the data which has become the pivotal. The petition for the increase in the data volume has increased with the expanding utilization of third and fourth generation. Versatile communication frameworks have increased the dependency on modern communication system. Every communication system has a transceiver inbuilt, in which the transmitter is used to send the signal while the receiver is used to receive the signal. But due to presence of noise the transmitted signal is not the same as that of receive signal. It gets distorted; various steps are taken in order to reduce the effect of noise including utilization of various modulation techniques. The method of digital data encoding and decoding is with tramission on multiple carrier is Orthogonal Frequency Division Multiplexing (OFDM). It found its application in Digital Television and audio broadcasting, Wireless network, mobile communication. Because of its application, it has become the talk of today and a hot topic for research.



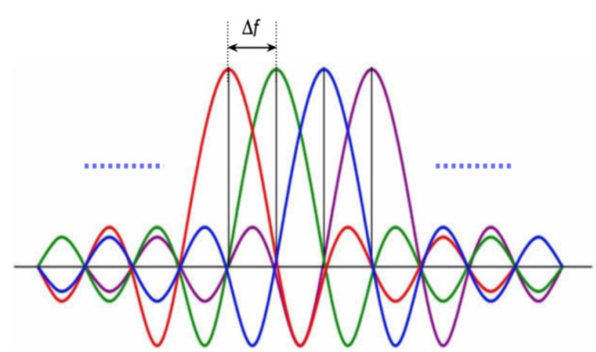


Fig 1.1 a) Wide carrier separation in Frequency Division Multiplexing

b) OFDM with subcarrier signal

As the demand of time, wireless communication is increasing. It becomes important to send more than one signal at the same time. This requirement can be fulfilled using multi-carrier which is commonly used in the wireless network. One commonly used multi-carrier technique is Orthogonal Frequency Division Multiplexing (OFDM) which is commonly used in communication where efficient bandwidth is the utmost required with the high data rate. Due to these features, the OFDM has become one of the stands in wireless communication. Robustness to the multi-path fading is the other two factors that make OFDM the standard for wireless

LAN systems and terrestrial digital broadcasting [1]. The entire spectrum in OFDM is divided into subcarriers and these sub-carriers have a low data rate. The inter-symbol interference (ISI) in OFDM can further be reduced by increasing the spacing between two spectrums and this difference is known as grad band. Throughout OFDM, frequent usage of a guard band to minimize inter-carrier intrusion (ICI) is prolonged. The benefit of the OFDM program is the potential to fad in wireless networking circumstances [2]. Discriminating fading level may be minimized by adding further subcarriers in the signal. Using the coherence bandwidth more than the channel subcarrier bandwidth will influence the channel bandwidth and will eliminate the need of channel equalizer [3][5].

II. OFDM SYSTEM MODEL

Figure 1.3 represents the block diagram of the OFDM transceiver. At the beginning using Inverse Fast Fourier Transform (IFFT), the input is given to the channel encoder that maps the data to the set of QAM / QPSK / BPSK to achieve the OFDM time domain symbols. Symbols for the time domain can be expressed as [4]:

$$x_n = IFFT\{X_k\} = \frac{1}{N}\sum_{k=0}^{N-1} X_k\, e^{\frac{j2\pi kn}{N}} \qquad 0 \le n \le N-1 \tag{1.1}$$

Where, X_k = Symbol transmitted on subcarriers k^{th}

N = Full subcarriers.

Inter System Interference (ISI) can be prevented by using cyclic prefix (CP) for the Time-domain signal from the former OFDM code.

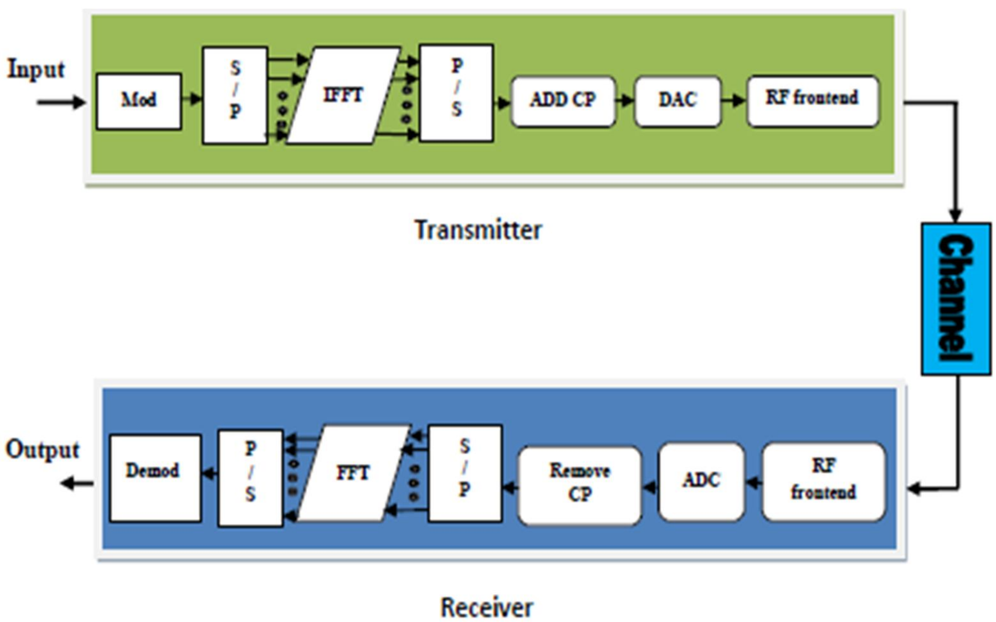


Figure 1.1: OFDM Transceiver

The Digital to Analog Converter (DAC) is used to transform into a clear symbol over the sophisticated baseband. The clear symbol at that stage is gone before the frontend of the Radio Frequency (RF) [7]. In the wake of approving the basic sign, the RF frontend executes functions. Using a mixer, the sign is modified to RF frequencies and amplified by using Power Amplifier (PAs) and then transmitted through radio wires. In the recipient line, the transmitted signal is turned down by RF frontend to the baseband frequency [8].

The original symbol is digitized by the Analog to Digital Converter (ADC), and re-sampled. The ADC is used to digitize the simple mark, and re-test it. The recurrence and period association square is not shown in the table due to straightforwardness. The cyclic suffix is removed from the sign-in recurrence sector. The square of the Quick Fourier Transform (FFT) stops the cycle. The frequency-domain signal can be given as [4][10]:

$$Y(k) = H(k)\, X_m(k) + W(k) \tag{1.2}$$

Where: Y (k) = Received Symbol on the k^{th}subcarrier
H (k) = frequency response of the channel on the same subcarrier
W (k) = additive noise added to k^{th} subcarrier (Gaussian random variable With zero means)
σ_w^2 = variance.

In this manner, straightforward one-tap recurrence space equalizers can be utilized to get transmitted images. After FFT signals are de-interleaved and decoded to recoup the first sign.

III. ADVANTAGES AND DISADVANTAGES OF OFDM SYSTEM

As described above the OFDM have a number of advantages with few disadvantages. Some of them are discussed below [9]:

A. *Benefits of OFDM*

Some of the benefits of an OFDM system are as follows [4], [6]:

1) OFDM resourceful utilization use of spectrum by consenting spectrum to overlap.
2) Differential fading is more immune to frequency than single carrier systems, as it separates the signal into small channels.
3) Applying advance coding techniques to OFDM the interleaving loss can be recovered by frequency selectivity of the channel.
4) Usage of cyclic prefix and fading initiated due to multipath fading the ISI and IFI issue can be reduced further respectively.
5) Implementing modulation and demodulation can be done by using FFT techniques.
6) It shows less sensitivity to sample timing techniques than single carrier systems.
7) Impulsive parasitic noise and co-channel interference can be reduced to a large extent.

B. *Disadvantages of OFDM*

With a number of advantages of OFDM, it suffers from a few of the disadvantage also namely [4], [6]:

1) High peak to average power ratios (PAPR) of the signal being transmitted;
2) The frequency difference is particularly prone to the sender.
3) If subcarriers are exchanged between multiple transmitters, it is impossible to synchronize.
4) OFDM signals have amplitude-like noise which renders removal difficult. An RF power amplifier is necessary.

IV. CONCLUSION AND FUTURE SCOPE

The paper provides an overview to orthogonal frequency division multiplexing with various advantage and disadvantage discussed in detail. Each method has different effects. We may use appropriate methods, based on requirement or efficiency. In this article, we examined various techniques for PAPR reduction and also contrasted certain techniques for different parameters. We note that SLM is the most successful technique for greatly minimizing PAPR and also improving device BER efficiency.

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