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# Literature Review on Design of OFDM Model

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***Abstract-***
In this paper we propose the literature review related to design of OFDM model using FFT & IFFT. Here we are going to define the Peak to Average Power Ratio (PAPR) along with Bit Error Rate(BER).At the same time we are trying to shift the frequency signal from one frequency band to another frequency band, so that we can use the same OFDM model on that shifted frequency .S, it is more advantageous to use the same model on other frequency. We are going to simulate the OFDM model using MATLAB.

***Keywords-*** *Communication system, DSP, MATLAB.*

## I. INTRODUCTION

Orthogonal Frequency Division Multiplexing (OFDM) is a multi-carrier system where data bits are encoded to multiple sub-carriers, while being sent simultaneously. This results in the optimal usage of bandwidth. A set of orthogonal sub-carriers together forms an OFDM symbol. To avoid ISI due to multi-path, successive OFDM symbols are separated by guard band. This makes the OFDM system resistant to multi-path effects.

The principles of OFDM modulation had around since 1960. Recently, the attraction towards OFDM has grown drastically in the field of wireless communication systems. This is shown by the adoption of this technique in applications such as digital audio/video broadcast (DAB/DVB), wireless LAN (802.11a and HiperLAN2), broadband wireless (802.16) and XDSL. In this work, a pure VHDL design, integrated with some intellectual property (IP) blocks, is employed to implement an OFDM transmitter and receiver. In this paper design of OFDM system using FFT and IFFT blocks has been introduced and simulation has done on MATLAB software.

## II . Overview of "OFDM"

Orthogonal Frequency Division Multiplexing (OFDM) is a special case of multicarrier transmission, where a single data stream is transmitted over a number of lower rate subcarriers. The main purpose to use OFDM is to improve the robustness against the selective fading or narrowband interference. In single carrier system, if signal gets fade or interfered then entire link gets affected, where as in multicarrier system only a small percentage of the subcarriers will be affected. The total signal bandwidth in a classical parallel data system, can be divided into N non-overlapping frequency sub-channels. Each sub-channel gets modulated a separate symbol and then N sub-channels are frequency multiplexed. The general practice of avoiding spectral overlap of sub-channels was applied to eliminate inter-carrier interference (ICI). This results in non-sufficient utilization of the existing spectrum. An idea was invented in the mid 1960s to deal with this wastefulness through the improvement of frequency division multiplexing (FDM) with overlapping sub-channels. The sub-channels were arranged so that the sidebands of the individual carriers overlap without causing inter carrier interference (ICI). To achieve this, the carriers must be mathematically orthogonal. From the above concept, the idea of Orthogonal Frequency Division Multiplexing (OFDM) has been invented.

## III. LITERATURE REVIEW

| Sr. No | Name of Author | Paper Title | Publication | Approach & concept about Work |
|---|---|---|---|---|
| 1 | Garcia, Puebla, Mexico Cumplido, R. | ON THE DESIGN OF AN FPGA-BASED OFDM MODULATOR FOR IEEE 802.12-2005 | Reconfigurable Computing and FPGAs, 2006. Re Con Fig 2006. National Conference | Current and future communication schemes are to use OFDM systems in order to support high baud rates and less inter symbol interference. Some examples are 802.11, 802.16, MC-CDMA, Digital Video Broadcasting, Wireless USB and Wireless Firewall. Providing a solution to the new evolving devices, slow standard adoption and poor spectrum use, Joe Mitola invented the concept of "Software Defined Radio" (SDR), which involves impressive configuration of digital signal processing like FFT. |
| 2 | R.W. Chaang | Synchronizing of band limited Orthoganal Signals for Multichannel data transmission. | IEEE Transaction on Bell syst. Tech. J., Vol. 43, pp. 1776-1777, October 1982 | It represents a principle of orthogonal multiplexing for transmitting a large number of data messages simultaneously through a linear bandwidth-limited communication medium at a maximum data rate without intersymbol and interchannel interferences. A general method is given for synchronizing a very large number of classes of band-limited orthogonal time functions in a compact frequency band. |
| 3 | Saltzbrg B. | "Performance of an efficient parallel data transmission system" | IEEE Transactions on Communication Technology, (Volume:14 , Issue: 8 | A parallel quadrature AM data transmission system may be implemented with a number of overlapping channels, each carrying a signaling rate, space db/3 apart in frequency. When a large number of channels are used, the system allows transmission speeds very close to the Nyquist symbol rate, with little sensitivity to delay and amplitude distortion of the transmission medium. The receiver requires precise phasing of the demodulating carriers and sampling times in order to keep crosstalk between channels less. In the presence of delay and amplitude distortion, better results are being obtained when half sine roll-off are used for shaping each channel than for full sine roll-off. |
| 4 | Mosir, Q.E. Clabag, R. G | Kineplex, a bandwidth accurate binary transmission system | American Institute of Electrical Engineers, Part1 Communication and Electronics, | SINCE WORLD WAR II, thousands of medium and large-scale scientific and business data-processing computers have been placed in governmental and industrial service throughout the country. With this growth has come the inevitable marriage of computing machinery to wire and radio communications. |
| 5 | Weinstein, S. Ebert, P. | Data transmission by Frequency Division Multiplexing using the DFT | IEEE Transaction on Telecommunicatio n, VOL. 24,VOL NO. 7, 2011 | The Fourier transform data communication system is a realization of frequency-division multiplexing (FDM) in which discrete Fourier transforms are computed as part of the modulation and demodulation processes. In addition to eliminating the bunks of subcarrier oscillators and coherent demodulators usually required in FDM systems, a completely digital implementation can be built around a special-purpose computer performing the fast Fourier transform |
| 6 | Santosh Kawade, Maziar Nekovee. | Design & Implementation of OFDM base band for The IEEE 802.16a WLAN | IEEE Asia-Pacific Conference on Advanced System Integrated Circuits 2004. Proceedings of 2004 | In the paper, we present the design and implementation of a baseband receiver with space diversity for IEEE 802.11a OFDM wireless local area network (WLAN). The single-antenna OFDM receiver has been implemented in a single chip. To improve the system performance, we adopt two antennae and apply maximal ratio combining (MRC) for attaining space diversity. We then implement an MRC-based IEEE 802.11a WLAN baseband receiver using two receiver . |

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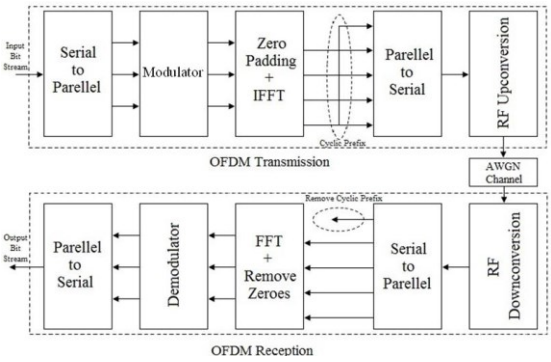
## IV. OFDM MODEL

We have to implement the OFDM block by block and finally interconnect all of them together to form complete OFDM circuit.




**Inverse Fast Fourier Transform (IFFT)**

Initially carrier bank generating a set of subcarriers was necessary for OFDM in conventional or analogue approach. Each sub-carrier has been modulated with a constellation decided by bit combination, but this approach made system bulky and costlier. So by using IFFT, the system can be made digital, simple, efficient and cheap. A stepwise implementation of butterfly diagram is done in this algorithm. Radix-2 Decimation-in-time (DIT) IFFT is implemented in this algorithm. Different procedures and operations are done to achieve this.

### FFT and Demodulator

For FFT modulation is being done and for IFFT Demodulation process is being used. In this design at FFT, if its output is 2.999 then FFT shows it as a 2 instead of 3. Care of this type of problems is taken by demodulator , which gives output as 3 for input 2 or 3.

## V. CONCLUSION

The main purpose of this project is that,we can shift the signal from low frequency to the high frequency and from high frequency to low frequency i.e.vice-versa. So that a same signal can be used in two or more frequency ranges. It means that if one frequency range is not available then we can move it on another range of frequency. It is been implemented using OFDM model. At the same time we are going to find the Bit Error Rate (BER) & Peak to Average Power Ratio( PAPR).

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## VII. REFERENCES

[1] A reference Joaquin Garcia, Rene Cumplido,“On the design of an FPGA-based OFDM modulator for IEEE 802.12.”, proceedings of 2006 international conference on reconfigurable computing and OFDM.

[2] Farzad Mhanavi, Yusef W. Shayan, “Implementation of an OFDM model for the network layer of IEEE 802.11a standard based on Xilinx Virtex-II FPGA.”,a 0-7808-8255-2/04/$21.00 2005 IEEE.

[3] R.Wan Nee, S. Phrasad Publication by Artech Home,"OFDM for wireless Multimedia Communications".

[4] R.W. Chaang, "Synthesis of band Ristricted Orthoganal Signals for so many channel data communication," Bell system. Tech. J., Vol. 45, pp. 1776-1777, December.1992.

[5] Salzberg, A. R., "Performance of an well efficient parallel data communication system," IEEE transaction comm., Vol. COM-14, pp. 805-812, December. 1977.

[6] Mosier, R. R., and R. G. Clabaugh, "Kineplex, a bandwidth efficient binary transmission system," AIEE Trans. Vol. 75. pp., 722-728, January. 1957.

[7] Weinstein, W. B., and P. M. Elbert, "Data communication by Frequency Division Multiplexing using the DFT-IDFT," IEEE Trans. Comm., Vol. COM – 19, pp. 629-634, October.1970.

[8] Horosaki B., "An orthogonally multiplexed QAM system using the DFT," IEEE Trans. Comm. Vol. COM-29, pp. 982-989, July 1981.