A Review on Optimization of Inter Symbol Interference for Transmitter and Receiver of CDMA, UWB and OFDM for High Order Modulation Technique

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Abstract-

With the increase of growing demand of high data rate in mobile communication. The technology like CDMA, OFDM, and UWB will play an important role to satisfy the demands of peoples. One can generate a high browsing speed using a higher order modulation scheme but the inter symbol interference will be more that may effect the performance of a System. This review focus on the designing of CDMA, OFDM and UWB Transmitter and Receiver for higher modulation scheme with better optimization Techniques to reduce ISI as compared to existed one.

Keywords: CDMA, OFDM, UWB, ISI

1. INTRODUCTION:

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio. With radio waves distances can be short, such as a few meters for television or as far as thousands or even Millions of kilometres for deep-space radio communications. Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems (e.g. radio transmitters and receivers, remote controls etc.) which use some form of energy (e.g. radio waves, acoustic energy, etc.) to transfer information without the use of wires. Information is transferred in this manner over both short and long distances [1-2].

2. UWB TECHNOLOGY:

UWB wireless communications offers a radically distinct approach to wireless communication compared to traditional narrow band systems. According to the FCC, UWB is any signal that has a fractional bandwidth equal to or greater than 0.20 or has a bandwidth equal to or greater than 500 MHz .UWB technologies can transmit extremely short and low power electro-magnetic pulses. The radio spectrum spreads over a very wide bandwidth.Due to its short pulse radio frequency (RF) waveforms and large bandwidth, UWB provides fine time resolution and provides good potential for application in ranging and positioning and well immunity to multipath effects [3].

3. CDMA TECHNOLOGY:

Code division multiple access (**CDMA**) is a channel access method used by various radio communication technologies. CDMA is an example of multiple accesses, which is where several transmitters can send information simultaneously over a single communication channel. This allows several users to share a band of frequencies (see bandwidth). CDMA is a spread spectrum multiple access technique. A spread spectrum technique spreads the bandwidth of the data uniformly for the same transmitted power. A spreading code is a pseudo-random code that has a narrow ambiguity function, unlike other narrow pulse codes. In CDMA a locally generated code runs at a much higher rate than the data to be transmitted. Data for transmission is combined via bitwise XOR (exclusive OR) with the faster code. In CDMA we do modulation twice. First with a binary sequence g(t), the properties of which we will discuss below and then by a carrier. The binary sequence modulation ahead of the carrier modulation accomplishes two functions, 1. It spread the signal and 2. It introduces a form of encryption because the same sequence is needed at the receiver to demodulate the signal. In IS-95 and CDMA 2000 we do this three times, once with a code called Walsh, then with a code called Short Code and then with one called Long code.

3.2. Advantages of asynchronous CDMA over other techniques:

Spread-spectrum characteristics of CDMA:

Most modulation schemes try to minimize the bandwidth of this signal since bandwidth is a limited resource. However, spread spectrum techniques use a transmission bandwidth that is several orders of magnitude greater than the minimum required signal bandwidth. These systems were designed using spread spectrum because of its security and resistance to jamming. Asynchronous CDMA has some level of privacy built in because the signal is spread using a pseudo-random code; this code makes the spread spectrum signals appear random or have noise-like properties. A receiver cannot demodulate this transmission without knowledge of the pseudo-random sequence used to encode the data. CDMA can also effectively reject narrow band interference. Since narrow band interference affects only a small portion of the spread spectrum signal, it can easily be removed through notch filtering without much loss of information [4].

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3.1. Flexible allocation of resources: Asynchronous CDMA offers a key advantage in the flexible allocation of resources i.e. allocation of a PN codes to active users.

4. OFDM: ORTHOGONAL

Frequency-division multiplexing (**OFDM**) is a method of encoding digital data on multiple carrier frequencies. OFDM is essentially identical to coded OFDM (COFDM) and discrete multi-tone modulation (DMT), and is a frequency-division multiplexing (FDM) scheme used as a digital multi-carrier modulation method. The word "coded" comes from the use of forward error correction (FEC). A large number of closely spaced orthogonal sub-carrier signals are used to carry data on several parallel data streams or channels. Each sub-carrier is modulated with a conventional modulation scheme (such as quadrature amplitude modulation or phase-shift keying) at a low symbol rate, maintaining total data rates similar to conventional *single-carrier* modulation schemes in the same bandwidth.

4.1. Advantages of OFDM: High spectral efficiency as compared to other double sideband modulation schemes, spread spectrum, etc. Can easily adapt to severe channel condition without complex time-domain equalization. Robust against narrow-band co-channel interference. Robust against intersymbol interference (ISI) and fading caused by multipath propagation .Efficient implementation using Fast Fourier Transform (FFT).Low sensitivity to time synchronization errors .Tuned sub-channel receiver filters are not required (unlike conventional FDM).Facilitates single frequency networks (SFNs), i.e., transmitter macrodiversity.

5. EXISTING METHODOLOGY:

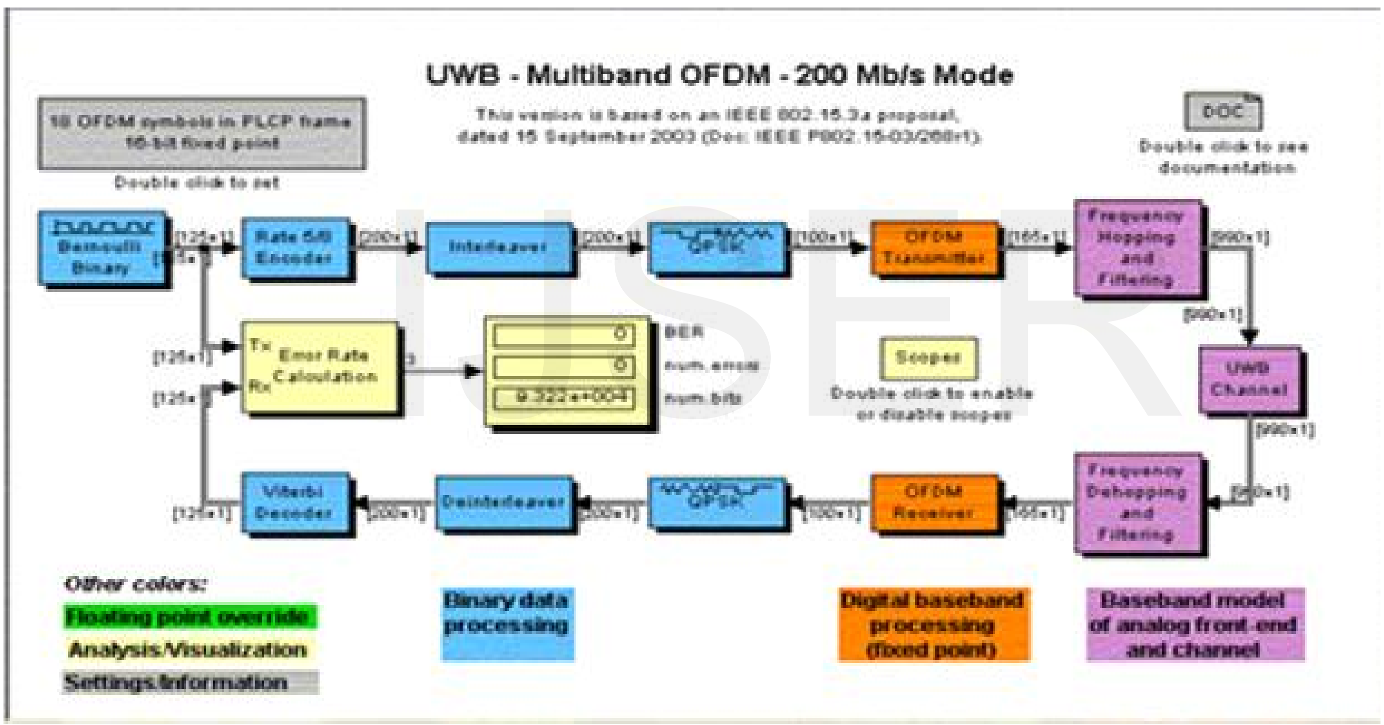

Fig1.Block Diagram of UWB

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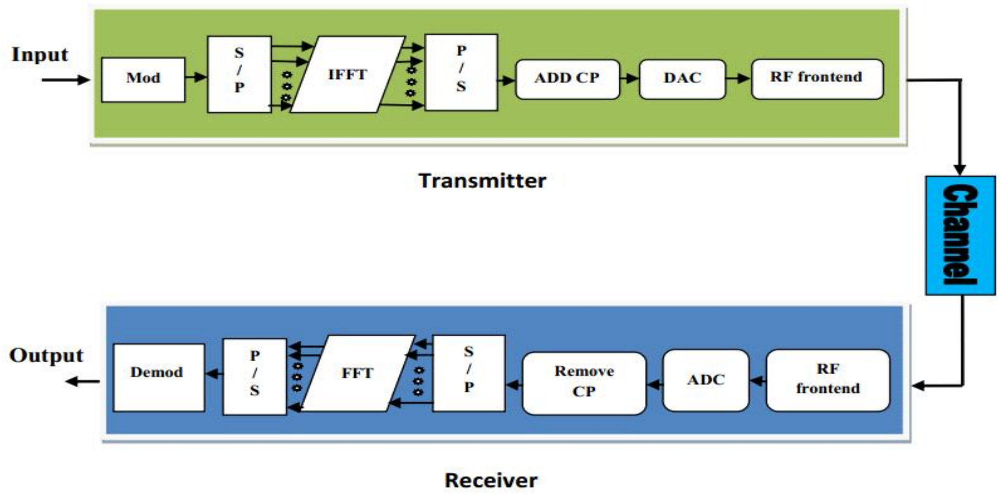


Fig2. Block Diagram of OFDM

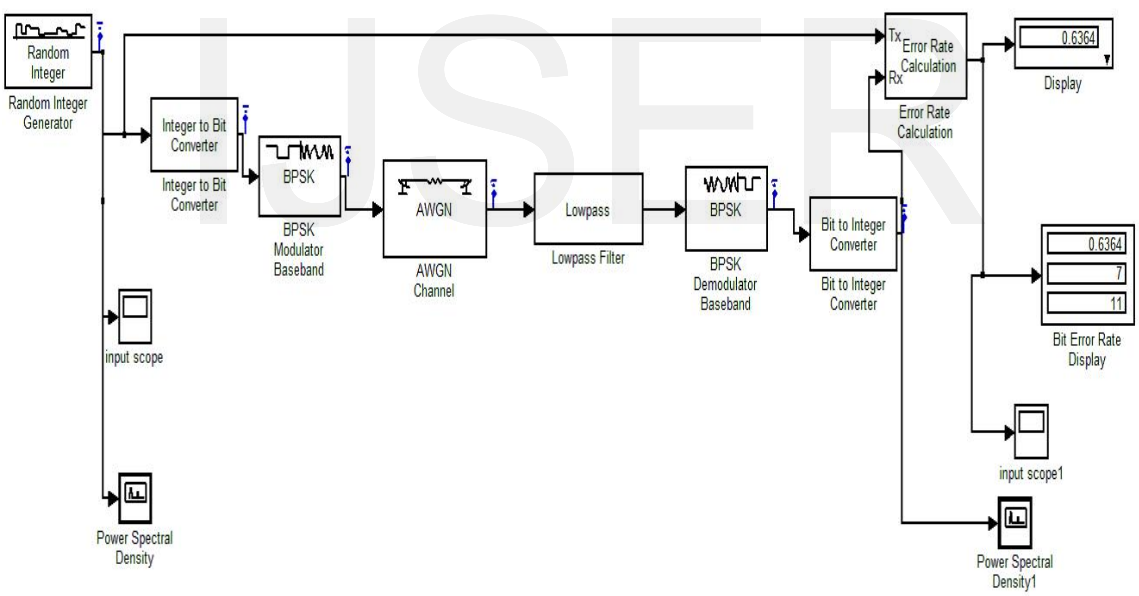


Fig.3.Block Diagram of CDMA

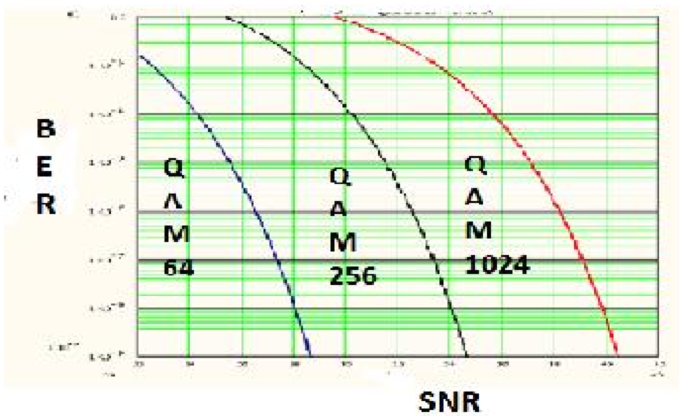
6. Review of Literature:

Inter-symbol interference (ISI) is a form of distortion of a signal in which one symbol interferes with subsequent symbols. This is an unwanted phenomenon as the previous symbols have similar effect as noise, thus making the communication less reliable. ISI is usually caused by multipath propagation or the inherent non-linear frequency response of a channel causing successive symbols to "blur" together. The presence of ISI in the system introduces errors in the decision device at the receiver output. Therefore, in the design of the transmitting and receiving filters, the objective is to minimize the effects of ISI, and thereby deliver the digital data to its destination with the smallest error rate possible. One of the causes of intersymbol interference is what is known as multipath propagation in which a wireless signal from a transmitter reaches the receiver via many different paths. The causes of this include reflection (for instance, the signal may bounce off buildings), refraction (such as through the foliage of a tree) and atmospheric effects such as atmospheric ducting and ionospheric reflection. Since the various paths are of different lengths, this results in the different versions of the signal arriving at the receiver at different times. These delays mean that part or all of a given symbol will be spread into the subsequent symbols, thereby interfering with the correct detection of those symbols. Additionally, the various paths often distort the amplitude and/or phase of the signal thereby causing further interference with the received signal. Another cause of intersymbol interference is the transmission of a signal through a bandlimited channel, i.e., one where the frequency response is zero above a certain frequency (the cutoff frequency). Passing a signal through such a channel results in the removal of frequency components above this cutoff frequency; in addition, the amplitude of the frequency components below the cutoff frequency may also be attenuated by the channel.

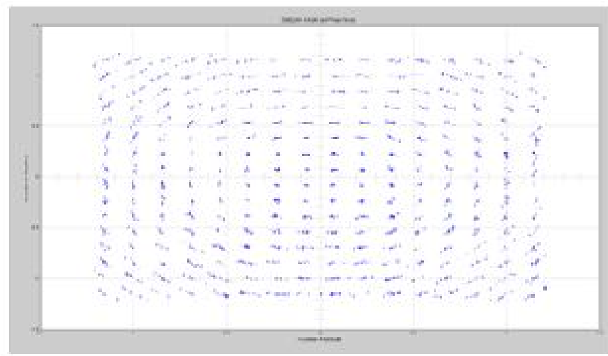
This filtering of the transmitted signal affects the shape of the pulse that arrives at the receiver. The effects of filtering a rectangular pulse; not only change the shape of the pulse within the first symbol period, but it is also spread out over the subsequent symbol periods [5-8].This study done by H. Kobayashi et.al deals with the problem of equalizing channels containing strong intersymbol interference. Typical of such channels are those of digital magnetic recording systems and data communication systems with partial-response signaling. First they discuss reasons that a conventional receiver with a linear equalizer cannot efficiently compensate for distortion in such channels. Then they present a new receiver configuration in which the equalizer and quantizer are embedded in an inverse filter circuit that eliminates major intersymbol interference components. The configuration allows us to use a simple iteration algorithm to adaptively adjust the equalizer [9]. ***Güner Arslan reduced ISI by using*** Zero-forcing equalizer, Minimum mean squared error (MMSE) equalizer, Decision-feedback equalizer [10]. Chen et.all proposed several novel iterative soft decision feedback equalization algorithms for detection of binary-valued two-dimensional images corrupted by 2D intersymbol interference (ISI) and additive white Gaussian noise (AWGN). These algorithms exchange weighted soft extrinsic information between maximum-a-posteriori (MAP) detectors employing different row-column or zigzag scan directions [11]. Yang yang chen proposed Combining the V-BLAST method, and using decision feedback technique for ISI cancelation and a cyclic reconstruction technique for ICI removal to overcome isi in OFDM [12]. Partial response maximum likelihood" (PRML) can also reduced inter symbol interference [13]. Two major impediments to high-performance digital wireless communication systems are intersymbol interference (ISI) and cochannel interference (CCI). ISI is caused by the frequency selectivity (time dispersion) of the channel due to multipath propagation. Equalizers can be used to compensate for these channel distortions. One may design an equalizer given the received signal, or one may first estimate the channel impulse response and then design an equalizer based on the estimated channel. CCI, on the other hand, arises from cellular frequency reuse and thus limits the quality and capacity (number of users) of wireless networks. CCI can be reduced by the use of adaptive antenna arrays (also known as ”smart antennas”) [14-18].

An important requirement in the design of data transmission filters is the minimization of intersymbol interference, which is zero if the overall impulse response (transmit filter, channel and receive filter) satisfies the first Nyquist criterion. In this context, an important class of transfer functions, satisfying the Nyquist criterion, is the raised-cosine filter family. In order to guarantee low interference between adjacent channels, the transmit and receive filters must have a high value of stopband attenuation, so as to reduce the interchannel interference as much as possible. Marina proposed a design method for finding the coefficients of a pair of linear-phase transmit/receive FIR filters, that when cascaded have raised-cosine frequency response, is presented. The design is based on Frequency Sampling techniques, and the filter parameters are chosen in order to obtain maximum stopband attenuation and low intersymbol interference. The filter coefficients can be easily evaluated and the optimal filter parameters can be obtained with tables or equations. The design method is very simple, completely automatic and suited for non-filter-oriented users. Look-up table techniques can be used for automatic re-design of the transmit and receive filters, making the proposed solution well suited to programmable computing platforms (FPGA—Field Programmable Gate Arrays- and PLD---Programmable Logic Devices-based platforms), or for applications where the design must be performed without any user intervention. The proposed filter design technique is quite simple and the results obtained often match the performance of filter designed using computationally more complex and conceptually more difficult methods [19].

Mr. Bipin Patil proposed a physical layer UWB system design based on multicode direct sequence spread spectrum allowing an efficient use of linear receivers. This choice method provides high data rates and reduced complexity. We showed that many parameters need to be optimized in this context in such a way to reduce the intersymbol and the intercode interference. The data rate is increased by increasing the number of superimposed codes assigned to the same user. At the same time, the code lengths are kept long to obtain good performance of the linear receivers. Compared to existing proposals, our system design allows to enlarge the system range by quite large quantities especially for high bit rates [20].



Problem 1. High SNR is Required



Problem2. Inter Symbol Interference

7. CONCLUSION:

The CDMA, UWB and OFDM Transmitter and Receiver will be implemented with high order modulation Technique, and we are looking for less ISR as compare to existing technology.

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