Ber Calculation Using Matlab Simulation For Ofdm Transmission

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Abstract—Orthogonal frequency division multiplex (OFDM) modulation is being used more and more in telecommunication, wired and wireless. DVB and DAB already use this modulation technique and ADSL is based on it. The advantages of this modulation are the reason for its increasing usage. OFDM can be implemented easily, it is Spectraly efficient and can provide high data rates with sufficient robustness to channel imperfections.

The purpose of this paper is to use a Matlab simulation of OFDM to see how the Bit Error Ratio (BER) of a transmission varies when Signal to Noise Ratio (S/N Ratio) and Multipropagation effects are changed on transmission channel.

Index Terms— BER, FFT, ISI, OFDM, S/N

I. INTRODUCTION

In an OFDM [4] scheme a large number of sub-channels or sub-carriers are used to transmit digital data. Each sub-channel is orthogonal to every other. They are closely spaced and narrow band. The separation of the sub-channels is as minimal as possible to obtain high spectral efficiency. OFDM is being used because of its capability to handle with multipath interference at the receiver.

These two are the main effects of multipropagation [3]. Frequency selective fading and Inter Symbolic Interference (ISI) [5]. In OFDM the large number of narrow band sub-carriers provides sufficiently "flat" channels. Therefore the fading can be handled by simple

equalizing techniques for each channel. Furthermore the large amount of carriers can provide same data rates of a single carrier modulation at a lower symbol rate.

The symbol rate of each channel can be dropped to a point that makes each symbol longer than the channel's impulse response. This eliminates ISI.

The two main drawbacks of OFDM are the large dynamic range of the signals being transmitted and the sensitivity to frequency errors.

Using a Matlab simulation we can implement an OFDM transmission. Using the simulation we can easily change the values of S/N ratio [2] and change the multipropagation effects on the transmission. Then we can analyze the results of each transmission and see how the BER [1] is changed.

II. OFDM SIMULATION

A. The Matlab source code

The Matlab code used in this paper was developed by Alan C. Brooks and Stephan Hoelzer [8]. This implementation is used to transmit a computer file in binary data form modulated by OFDM and 16- QAM modulation. A scheme of every part of the implementation can be seen in Fig 1. As it can be seen in the figure channel imperfections are modeled in this implementation. In the end of the transmission, when the receiver receives the data, a comparison of the transmitted and the received messages is done in order to calculate the Bit Error Ratio (BER).

This paper does not explain in detail the simulation code. It uses it to create results and see the behavior of OFDM under different channel properties. Nevertheless some of the main variables of the code are described, because the choice of them has a critical effect on the results.
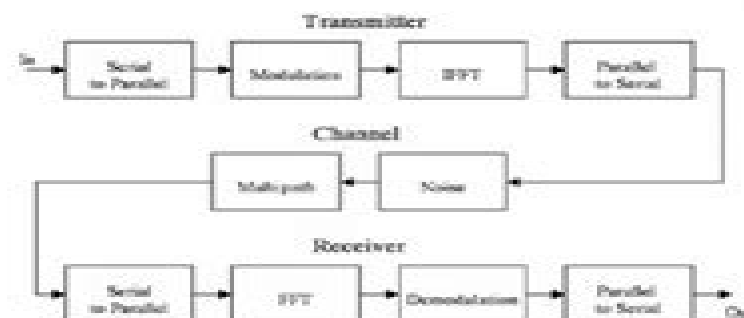

Figure 1. Matlab Flow Chart

B. General Options in the Simulation

The general options of each transmission are in the setup.m file of the simulation. Two of the most important variables are analyzed.

One of the main characteristics of every simulation model of OFDM is the size of the fast Fourier transformation (FFT) used to generate the signal. In the

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papers presented were carefully reviewed and selected from several initial submissions The papers are organized in topical sections on Signal Image and Speech Processing Wireless and Mobile Communication Internet of Things Cloud and Edge Computing Distributed Systems Machine Intelligence Data Analytics Cybersecurity Artificial Intelligence and Cognitive Computing and Circuits and Systems The book is directed to the researchers and scientists engaged in various fields of computing and network communication domains *Proceedings of the 2009 International Conference on Signals, Systems and Automation (ICSSA 2009)* Himanshu Soni,2010-04-30 This book is a collection of papers from the 2009 International Conference on Signals Systems and Automation ICSSA 2009 The conference at a glance Pre conference Workshops Tutorials on 27th Dec 2009 Five Plenary talks Paper Poster Presentation 28 29 Dec 2009 Demonstrations by SKYVIEWInc SLS Inc BSNL Baroda Electric Meters SIS On line paper submission facility on website 200 papers are received from India and abroad Delegates from different countries including Poland Iran USA Delegates from 16 states of India Conference website is seen by more than 3000 persons across the world 27 countries and 120 cities **Index to IEEE Publications** Institute of Electrical and Electronics Engineers,1997 **Applications of MATLAB in Science and Engineering** Tadeusz Michalowski,2011-09-09 The book consists of 24 chapters illustrating a wide range of areas where MATLAB tools are applied These areas include mathematics physics chemistry and chemical engineering mechanical engineering biological molecular biology and medical sciences communication and control systems digital signal image and video processing system modeling and simulation Many interesting problems have been included throughout the book and its contents will be beneficial for students and professionals in wide areas of interest **Interference Mitigation for Multi-band OFDM Using Diversity Combining and Erasure Based Methods** Eric Paul Reinbold,2005 **Advances in Computing, Communication, Automation and Biomedical Technology** M. G. Sumithra ,Arulmurugan Ramu ,Chow Chee Onn,2020-12-30 Advances in Computing Communication Automation and Biomedical Technology aims to bring together leading academic scientists researchers industry representatives postdoctoral fellows and research scholars around the world to share their knowledge and research expertise to advances in the areas of Computing Communication Electrical Civil Mechanical and Biomedical Systems as well as to create a prospective collaboration and networking on various areas It also provides a premier interdisciplinary platform for researchers practitioners and educators to present and discuss the most recent innovations trends and concerns as well as practical challenges encountered and solutions adopted in the fields of innovation Mobile Lightweight Wireless Systems Javier Del Ser,Eduard Axel Jorswieck,Joaquin Miguez,Marja Matinmikko,Daniel P Palomar,Sancho Salcedo Sanz,Sergio Gil-Lopez,2012-04-23 This book constitutes the thoroughly refereed post conference proceedings of the Third International ICST Conference Mobile Lightweight Wireless Systems MOBILIGHT 2011 held in Bilbao Spain on May 9 10 2011 In numbers MOBILIGHT 2011 was organized as a 2 day single track event with 18 technical presentations and 3 specialized workshops focused on opportunistic sensing and processing in mobile wireless sensor and

cellular networks MOBISENSE multimode wireless access networks MOWAN and strategic network planning applied to market regulation NETSTRAT totaling to 34 papers presented during the conference and included in the proceedings

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