

# Bit Error Rate Analysis in Simulation of Digital Communication Systems with Different Modulation Schemes

Dixit Datt Bohra<sup>1</sup>, Avnish Bora<sup>2</sup>

<sup>1</sup>M.Tech. Pursuing, Department of Electronics & Communication Engineering, Jodhpur National University, Jodhpur, Rajasthan, India

<sup>2</sup>Head & Associate Professor, Department of Electronics & Communication Engineering, Jodhpur National University, Jodhpur, Rajasthan, India

## Abstract

With the increasing demand in communication, it has become necessary to give better and efficient service to users by using better technique. This paper analyse the bit error rate, for different modulation schemes such as Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK). By Choosing a reliable modulation scheme and better coding technique the enhancement of the performance can be obtained in transmitter and receiver of the system. Simulated result is shown to analyse and compare the performance of these systems by using additive white Gaussian noise channel (AWGN). Finally the different modulation schemes are compared on the basis of BER and best modulation scheme is determined. From analysis of two modulation techniques, the system could use more appropriate modulation technique to suit the channel quality, thus we can deliver the optimum and efficient system parameters. LabVIEW has been used for simulation.

**Keywords:** LabVIEW, BER, AWGN

## 1. Introduction

The history of communication gives us insight into the way it influenced the development of civilization and still exerts an influence on modern societies. Communication can be defined simply as 'sending and receiving messages', or 'the transmission of messages from one person to another'. Effective communication occurs only when the receiver understands the exact message sent by the transmitter. [17]

A communication system is made up of devices that employ one of two communication methods (wireless or wired), different types of equipment (portable radios, mobile radios, base/fixed station radios, and repeaters), and various accessories (examples include speaker microphones, battery eliminators, and carrying cases) and/or enhancements (encryption, digital communications, security measures, and interoperability/networking) to meet the user needs.

In the series of communication methods, one of them is Wireless communications. It has become one of the fastest growing areas in our modern life and creates enormous impact on nearly every feature of our daily life. A tremendous technological transformation during the last two decades has provided a potential growth in the area of digital communication.

Living in the era of communication everything may be video, audio or any information in the form of electrical signal

is termed as data and there is an enormous requirement of data transfer between two or more point through the world wide web, every moment of the clock, which is a big threaten to the existing communication systems because of the problems like spectral congestion, severe adjacent & co-channel interference problems and noise corrupted data reception etc. This has resulted in serious need for the research work all around the world for the development of the communication systems which can handle the above said problems, where each aspect of the communication systems is dealt with the development of new encoding techniques, modulation techniques, possibilities for newer transmission channels and off course the demodulation and decoding techniques. [7]

The next generation of wireless communication systems faces the demand for increased data rates, higher mobility, larger carrier frequencies, and more link reliability. Wireless channels are characterized by fading, multipath, limited bandwidth, and frequency and time selectivity which make system design a challenge. It is therefore crucial to have an understanding of the behavior of wireless channels in order to know their performance limits and to be able to design efficient communication systems for them. This dissertation considers the analysis of the performance of digital communication systems with different coding and modulation schemes.

Although digital communication is much better than the analog communication, still it has certain issues that need to be addressed. Especially when it comes to wireless communication, one of the major research considerations becomes the effect of multipath propagation. A thorough analysis is necessary for strategic planning of any system design by doing comparative study of different modulation techniques via different multipath communication channels. To study and draw the graph in terms BER versus Eb/No in multipath communication channels for modulation schemes. Therefore, understand the system could go for more suitable modulation technique to suit the channel quality and can suggest better modulation schemes. [3]

## 2. Modulation and Channel Schemes

The purpose of any digital communication system is to transmit data from an information source to an information sink. At a minimum, a baseband waveform must be constructed from the symbols making up the information. Some media, such as coaxial cable, can propagate baseband waveforms with

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**Chaos-Based Digital Communication Systems** Francis C.M. Lau, Chi K. Tse, 2003-04-29 One of the first books in this area this text focuses on important aspects of the system operation analysis and performance evaluation of selected chaos based digital communications systems a hot topic in communications and signal processing *PERFORMANCE OF QAM SYSTEM WITH CONVOLUTIONAL CODES* K. Pranathi, Dr M. Vijaya Lakshmi, *Digital Communication System Using System VUE* Denis Silage, 2006 **Advanced Signal Integrity for High-Speed Digital Designs** Stephen H. Hall, Howard L. Heck, 2011-09-20 A synergistic approach to signal integrity for high speed digital design This book is designed to provide contemporary readers with an understanding of the emerging high speed signal integrity issues that are creating roadblocks in digital design Written by the foremost experts on the subject it leverages concepts and techniques from non related fields such as applied physics and microwave engineering and applies them to high speed digital design creating the optimal combination between theory and practical applications Following an introduction to the importance of signal integrity chapter coverage includes Electromagnetic fundamentals for signal integrity Transmission line fundamentals Crosstalk Non ideal conductor models including surface roughness and frequency dependent inductance Frequency dependent properties of dielectrics Differential signaling Mathematical requirements of physical channels S parameters for digital engineers Non ideal return paths and via resonance I O circuits and models Equalization Modeling and budgeting of timing jitter and noise System analysis using response surface modeling Each chapter includes many figures and numerous examples to help readers relate the concepts to everyday design and concludes with problems for readers to test their understanding of the material Advanced Signal Integrity for High Speed Digital Designs is suitable as a textbook for graduate level courses on signal integrity for programs taught in industry for professional engineers and as a reference for the high speed digital designer **Proceedings of the Trends in Electronics Conference** ,1989 **Conference Proceedings** ,1991 **Annales des télécommunications** ,2007 *ICASSP 90: Digital signal processing* ,1990 **IEEE International Conference on Communications, 1992** IEEE Communications Society,1992 IEEE Digital Signal Processing Workshop ,1994 **Proceedings of the 1974 Summer Computer Simulation Conference** ,1974 *The Telecommunications and Data Acquisition Report* ,1996 Proceedings of the National Communications Forum ,1974 *Proceedings of the National Electronics Conference* ,1974 **Conference Record** ,1994 **Symposium Record** ,1996 Proceedings of IEEE Singapore International Conference on Networks/International Conference on Information Engineering 1995 Gee-Swee Poo, E. S. Seumahu, 1995 **System Modeling and Analysis** Hisashi Kobayashi, Brian Lai-bue Mark, 2009 Kobayashi and Mark present the most up to date analytical models simulation techniques and computational algorithms useful for performance evaluation of complex systems including computer systems communication networks transportation systems and manufacturing systems Broader in scope than other texts this book provides more in depth coverage of topics such as

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## **Table of Contents Bit Error Rate Analysis In Simulation Of Digital**

1. Understanding the eBook Bit Error Rate Analysis In Simulation Of Digital
  - The Rise of Digital Reading Bit Error Rate Analysis In Simulation Of Digital
  - Advantages of eBooks Over Traditional Books
2. Identifying Bit Error Rate Analysis In Simulation Of Digital
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Bit Error Rate Analysis In Simulation Of Digital
  - User-Friendly Interface
4. Exploring eBook Recommendations from Bit Error Rate Analysis In Simulation Of Digital
  - Personalized Recommendations
  - Bit Error Rate Analysis In Simulation Of Digital User Reviews and Ratings

- Bit Error Rate Analysis In Simulation Of Digital and Bestseller Lists
- 5. Accessing Bit Error Rate Analysis In Simulation Of Digital Free and Paid eBooks
  - Bit Error Rate Analysis In Simulation Of Digital Public Domain eBooks
  - Bit Error Rate Analysis In Simulation Of Digital eBook Subscription Services
  - Bit Error Rate Analysis In Simulation Of Digital Budget-Friendly Options
- 6. Navigating Bit Error Rate Analysis In Simulation Of Digital eBook Formats
  - ePub, PDF, MOBI, and More
  - Bit Error Rate Analysis In Simulation Of Digital Compatibility with Devices
  - Bit Error Rate Analysis In Simulation Of Digital Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Bit Error Rate Analysis In Simulation Of Digital
  - Highlighting and Note-Taking Bit Error Rate Analysis In Simulation Of Digital
  - Interactive Elements Bit Error Rate Analysis In Simulation Of Digital
- 8. Staying Engaged with Bit Error Rate Analysis In Simulation Of Digital
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Bit Error Rate Analysis In Simulation Of Digital
- 9. Balancing eBooks and Physical Books Bit Error Rate Analysis In Simulation Of Digital
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Bit Error Rate Analysis In Simulation Of Digital
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Bit Error Rate Analysis In Simulation Of Digital
  - Setting Reading Goals Bit Error Rate Analysis In Simulation Of Digital
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Bit Error Rate Analysis In Simulation Of Digital
  - Fact-Checking eBook Content of Bit Error Rate Analysis In Simulation Of Digital
  - Distinguishing Credible Sources

13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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