

Ofdm For Wireless Communications Systems

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 Introduction to Ultra Wideband for Wireless Communications
 OFDM and MC-CDMA for Broadband Multi-User Communications, WLANs and Broadcasting

*Ofdm For Wireless
 Communications
 Systems*

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GIOVANNA BRAYLON

A Theoretical and Practical Guide

Springer

Relay systems have become a subject of intensive research interest over the recent years, as it is recognized that they can improve performances and extend the coverage area of wireless communication systems. Special attention has been dedicated to them since the proposal appeared for their implementation in mobile cellular systems. Numerous researches conducted after that proposal have enabled incorporation of OFDM based relay systems in both accepted standards for IMT-Advanced systems. Nowadays, researches are ongoing with the aim to define new solutions for

performance improvement of the standardized OFDM relay systems for cellular networks and one of the interesting solutions is implementation of subcarrier permutation (SCP) at the relay (R) station. The book "OFDM based relay systems for future wireless communications" presents a comprehensive research results in analyzing behavior and performance of the OFDM based relay systems with SCP. Dual-hop relay scenario with three communication terminals, and no direct link between the source (S) and the destination (D) has been analyzed, as it is compliant with the accepted solutions for IMT-Advanced systems. The book includes performance analysis and performance comparison of OFDM based: amplify-and-forward (AF) relay systems with fixed gain (FG), amplify-and-forward (AF) relay systems with variable gain (VG), decode-

and-forward (DF) relay systems, each including two SCP schemes, known to maximize the system capacity and/or improve the bit error rate (BER) performances. Performance comparisons have enabled definition of optimal solutions for the future wireless communication systems in a given conditions, and for the given optimality criteria. OFDM based relay systems for future wireless communications contains recent research results in this area and is ideal for the academic staff and master/research students in area of mobile communication systems, as well as for the personnel in communication industry. Contents: 1. Introduction; 2. General overview of relay techniques; 3. OFDM relay systems; 4. Relay stations in wireless cellular networks; 5. Performance of OFDM AF FG relay systems with subcarrier permutation; 6. Performance of

OFDM AF VG relay systems with subcarrier permutation; 7. Performance of OFDM DF relay systems with subcarrier permutation; List of Abbreviations

From Mobile to 5G Springer Science & Business Media

Wireless communications is widely employed in modern society and plays an increasingly important role in people's daily life. The broadcast nature of radio propagation, however, causes wireless communications particularly vulnerable to malicious attacks, and leads to critical challenges in securing the wireless transmission. Motivated by the insufficiency of traditional approaches to secure wireless communications, physical layer security that is emerging as a complement to the traditional upper-layer security mechanisms is investigated in this dissertation. Five novel techniques toward the physical layer security of wireless communications are proposed. The first two techniques focus on the security risk assessment in wireless networks to enable a situation-awareness based transmission protection. The third and fourth techniques utilize wireless medium characteristics to enhance the built-in security of wireless communication systems, so as to prevent passive eavesdropping. The last technique provides an embedded confidential signaling link for secure transmitter-receiver interaction in OFDM systems. In order to effectively and efficiently defend against malicious attacks in a wire-less network, the transmission nodes need to understand the communication risk in the operating environment. A security level awareness scheme is proposed in this dissertation, where the number of active users in a multipath fading environment is estimated. A time domain pilot correlation (TDPC) algorithm for detecting OFDM signals with frequency domain inserted pilots is proposed to recognize the presence of active users, based on the cyclic correlation between the complex conjugate multiplication of received signal segments and a local time domain pilot reference. Taking advantage of a typical device fingerprint-I/Q imbalance, the number of active users is estimated through counting all the identified distinct transmitter I/Q imbalances. With regard to enhancing the built-in security of wireless communication systems against passive eavesdropping, two novel anti-eavesdropping OFDM systems are proposed by exploiting the reciprocal, location-dependent and time-varying nature of wireless channels. Based on the instantaneous channel state information (CSI) between the transmitter and legitimate receiver, dynamic coordinate

interleaving and subcarrier interleaving are employed in the two proposed secure OFDM systems, respectively. In the coordinate interleaving scheme, a transmitter performs coordinate interleaving at partial subcarriers of each OFDM signal, where the symbol coordinate of an OFDM subcarrier is interleaved in an opportunistic manner depending on the associated subcarrier channel gain or phase. The subcarrier interleaving strategy is realized by interleaving subcarriers of each OFDM signal according to the sorted order of their sub-channel gains. Since wireless channels associated with each pair of users at separate locations exhibit independent multipath fading, the frequently renewed security design can only be shared between legitimate users based on channel reciprocity. Consequently, eavesdropping is prevented due to mismatched information recovery at the eavesdropper. In the final part of the dissertation, the proposed anti-eavesdropping OFDM systems are upgraded by enabling an efficient and confidential side information transmission mechanism between the legitimate users, without interrupting the data transmission and requiring additional time and frequency resources. In the design, the cyclic prefix of an OFDM signal is replaced by a specially tailored orthogonal sequence. The side information is conveyed by the confidential orthogonal sequence that maintains the same time and frequency characteristics as the data-carrying OFDM symbol.

OFDM for Optical Communications

Springer Science & Business Media

Based on cutting-edge research projects in the field, this book (part of a comprehensive 4-volume series) provides the latest details and covers the most impactful aspects of mobile, wireless, and broadband communications development. These books present key systems and enabling technologies in a clear and accessible manner, offering you a detailed roadmap the future evolution of next generation communications. Other volumes cover Networks, Services and Applications; Reconfigurability; and Ad Hoc Networks.

Semi-Blind Carrier Frequency Offset Estimation and Channel Equalization

Springer Science & Business Media

Theory and Applications of OFDM and CDMA is an ideal foundation textbook for those seeking a sound knowledge of this fast-developing field of wideband communications. The advanced transmission techniques of OFDM, applied in wireless LANs and in digital and video broadcasting, and CDMA, the foundation of

3G mobile communications, have been part of almost every communication system that has been designed in recent years, with both offering a high degree of flexibility in adjusting the system to the requirements of the application and to the impairments caused by the transmission channel. Starting from the basics of digital transmission theory, the reader gains a comprehensive overview of the underlying ideas of these techniques and their strengths and weaknesses under various conditions. In this context, the specific requirements of the mobile radio channel and their relevance for the design of digital transmission systems are discussed and related to the items of channel coding and modulation. Clear explanation of the basics of digital communications, mobile radio channels, coding and modulation, OFDM as a multicarrier system and CDMA as an application of spread spectrum techniques Discusses the most important mobile radio and digital broadcasting systems that use OFDM and CDMA, and explains in detail the underlying ideas for the choice of system parameters Progresses from the fundamentals of wideband communication through to modern applications Includes a Companion Website featuring a solutions manual, electronic versions of the figures and other useful resources This volume will be an invaluable resource to advanced undergraduate students and first/second year postgraduates of electrical and engineering and telecommunications. It will also appeal to practising engineers, researchers and those in academia who wish to expand their knowledge on modern aspects of digital communications and systems in a mobile radio environment.

Optimizing Wireless Communication Systems Artech House

OFDM for Wireless Multimedia

Communications is the first book to take a comprehensive look at OFDM, including a comparison with other forms of single carrier modulation methods. This timely and practical new volume provides the design guidelines you need to maximize benefits from this important new technology.

Artech House Publishers

From the reviews: "This book [...] gives a comprehensive overview of the implementation of OFDM systems. [...] For those who study or work on broadband communication in a wireless multipath environment, this book is a useful and easy-to-read reference. [...]" (Zongsen Wu, Shaowen Song and Tianying Ji, Physics and Computing Dept., Wilfrid Laurier University, ON)

Ofdm Based Relay Systems for Future Wireless Communications John Wiley & Sons

asakta-buddhih sarvatra . jitatma vigata-sprhah naiskarmya-siddhim paramam . sannyasenadhigacchati Detached by spiritual intelligence from everything controlling the mind, without material desires, one attains the paramount perfection in cessation of re-tions by renunciation. The Bhagvad Gita (18.49) Compared to traditional carrier-based, Ultra-Wide Band (UWB), or carrier-less, systems implement new paradigms in terms of signal generation and reception. Thus, designing an UWB communication system requires the understanding of how excess bandwidth and very low transmitted powers can be used jointly to provide a reliable radio link. UWB offers systems transceiver potential for very simple implementations. Comparison between UWB and traditional narrow-band systems highlights the following features: Large bandwidth enables very fine time-space resolution for accurate location of the UWB nodes and for distributing network time stamps. Very short pulses are effectively counter-fighting the channel effect in very dense multipath environments. Data rate (number of pulses transmitted per bit) can be traded with power emission control and distance coverage. Very low power density leads to low probability of signal detection and adds security for all the layers of the communication stack. Very low power density is obtained through radio regulation emission masks; UWB systems are suitable for coexistence with already deployed narrow-band systems.

Index Modulation for OFDM

Communications Systems Artech House Universal Persona

For broadband communications, it was frequency division multiplexing. For optical communications, it was wavelength division multiplexing. Then, for all types of networks it was code division.

Breakthroughs in transmission speed were made possible by these developments, heralding next-generation networks of increasing capability in each case. The basic idea is the same: more channels equals higher throughput. For wireless communications, it is space-time coding using multiple-input-multiple-output (MIMO) technology. Providing a complete treatment of MIMO under a single cover, *MIMO System Technology for Wireless Communications* assembles coverage on all aspects of MIMO technology along with up-to-date information on key related issues. Contributors from leading academic and industrial institutions

around the world share their expertise and lend the book a global perspective. They lead you gradually from basic to more advanced concepts, from propagation modeling and performance analysis to space-time codes, various systems, implementation options and limitations, practical system development considerations, field trials, and network planning issues. Linking theoretical analysis to practical issues, the book does not limit itself to any specific standardization or research/industrial initiatives. MIMO is the catalyst for the next revolution in wireless systems, and *MIMO System Technology for Wireless Communications* lays a thorough and complete foundation on which to build the next and future generations of wireless networks.

Advanced Optical and Wireless Communications Systems John Wiley & Sons

em style="mso-bidi-font-style: normal;"*Wireless Communications Systems Design* provides the basic knowledge and methodology for wireless communications design. The book mainly focuses on a broadband wireless communication system based on OFDM/OFDMA system because it is widely used in the modern wireless communication system. It is divided into three parts: wireless communication theory (part I), wireless communication block design (part II), and wireless communication block integration (part III). Written by an expert with various experience in system design (standards, research and development)

Positioning in Wireless Communications Systems Springer Nature

This monograph is intended for the designers and would-be designers of secure and efficient wireless communication systems under intentional interference. Along with the widespread of wireless devices, especially reconfigurable software defined radios, jamming has become a serious threat to civilian communications. In this book, going beyond traditional communication system design that mainly focuses on accurate information transmission under benign environments, we aim to enhance the physical layer security of communication systems by integrating modern cryptographic techniques into transceiver design, so as to achieve secure high-speed transmission under hostile interference with high reliability and efficiency. We revisit existing jamming patterns, and introduce new jamming patterns. We analyze the weaknesses of existing anti-jamming techniques. We present

innovative and feasible anti-jamming techniques, which can strengthen the inherent security of the 3G, 4G and the upcoming 5G systems with minimal and inexpensive changes to the existing CDMA, frequency hopping and OFDM schemes. We also provide benchmarks for system performance evaluation under various jamming scenarios through capacity analysis. This book includes design principles, in-depth theoretical analysis and practical design examples, and will be of interest to academic researchers as well as professionals in industry.

Fast Orthogonal Frequency Division Multiplexing (Fast-OFDM) for Wireless Communications Springer

Written by leading authority Ramjee Prasad, this timely new work offers a complete understanding of OFDM technology and applications in wireless communications systems, placing emphasis on wireless LANs and PANs. OFDM is a key technology for beyond 3G communications, promising robust, high capacity, high speed wireless broadband multimedia networks. In this practical resource, established and new technologies are explained clearly and comprehensively, from OFDM basics to a detailed account of a new technique, hybrid OFDM CDMA slow frequency hopping.

New Directions in Wireless Communications Research Academic Press

Relay systems have become a subject of intensive research interest over the recent years, as it is recognized that they can improve performances and extend the coverage area of wireless communication systems. Special attention has been dedicated to them since the proposal appeared for their implementation in mobile cellular systems. Numerous researches conducted after that proposal have enabled incorporation of OFDM based relay systems in both accepted standards for IMT-Advanced systems. Nowadays, researches are ongoing with the aim to define new solutions for performance improvement of the standardized OFDM relay systems for cellular networks and one of the interesting solutions is implementation of subcarrier permutation (SCP) at the relay (R) station. The book "OFDM based relay systems for future wireless communications" presents a comprehensive research results in analyzing behavior and performance of the OFDM based relay systems with SCP. Dual-hop relay scenario with three communication terminals, and no direct

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Wideband Wireless Communications

Artech House Publishers

Orthogonal Frequency Division

Multiplexing (OFDM) systems are widely used in the standards for digital audio/video broadcasting, WiFi and WiMax. Being a frequency-domain approach to communications, OFDM has important advantages in dealing with the frequency-selective nature of high data rate wireless communication channels. As the needs for operating with higher data rates become more pressing, OFDM systems have emerged as an effective physical-layer solution. This short monograph is intended as a tutorial which highlights the deleterious aspects of the wireless channel and presents why OFDM is a good choice as a modulation that can transmit at high data rates. The system-level approach we shall pursue will also point out the disadvantages of OFDM systems especially in the context of peak to average ratio, and carrier frequency synchronization. Finally, simulation of OFDM systems will be given due prominence. Simple MATLAB programs are provided for bit error rate simulation using a discrete-time OFDM representation. Software is also provided to simulate the effects of inter-block-

interference, inter-carrier-interference and signal clipping on the error rate performance. Different components of the OFDM system are described, and detailed implementation notes are provided for the programs. The program can be downloaded here. Table of Contents: Introduction / Modeling Wireless Channels / Baseband OFDM System / Carrier Frequency Offset / Peak to Average Power Ratio / Simulation of the Performance of OFDM Systems / Conclusions
Wireless Communications Over Rapidly Time-Varying Channels CRC Press
This SpringerBrief investigates the performance of semi-blind independent component analysis (ICA) based equalization and carrier frequency offset estimation approaches (CFO) for a number of orthogonal frequency division multiplexing (OFDM) based wireless communication systems. It provides a comprehensive overview of the challenges of channel equalization and frequency synchronization for different wireless systems. The authors present the wireless communication channel and system models. Key existing CFO estimation methods are reviewed, along with a number of the training based and non-training based (blind) channel estimation methods. This is followed by a study of ICA and its applications to OFDM-based wireless communication systems. Later chapters provide a detailed description of recent research on semi-blind CFO estimation and ICA based equalization approaches for various wireless communication systems including multiple-input multiple-output (MIMO) OFDM and coordinated multipoint (CoMP) systems. Semi-blind CFO estimation and equalization structures provide a spectrum-efficient and high-performance solution for high speed wireless communications. This book is suitable for postgraduate students, researchers or professionals in the area of wireless communications.

CDMA for Wireless Personal

Communications LAP Lambert Academic Publishing

Wireless technology is a truly revolutionary paradigm shift, enabling multimedia communications between people and devices from any location. It also underpins exciting applications such as sensor networks, smart homes, telemedicine, and automated highways. This book provides a comprehensive introduction to the underlying theory, design techniques and analytical tools of wireless communications, focusing primarily on the core principles of wireless system design. The book begins with an

overview of wireless systems and standards. The characteristics of the wireless channel are then described, including their fundamental capacity limits. Various modulation, coding, and signal processing schemes are then discussed in detail, including state-of-the-art adaptive modulation, multicarrier, spread spectrum, and multiple antenna techniques. The concluding chapters deal with multiuser communications, cellular system design, and ad-hoc network design. Design insights and tradeoffs are emphasized throughout the book. It contains many worked examples, over 200 figures, almost 300 homework exercises, over 700 references, and is an ideal textbook for students.

OFDM Systems for Wireless

Communications CRC Press

OFDM for Wireless Communications

Systems Artech House

Impact and Digital Compensation

Cambridge University Press

In June 2000, GTEL (Wireless

Telecommunications Research Group) at the F-eral University of Ceara' was

founded by Professor Rodrigo Cavalcanti

and his c-leagues with the mission of

developing wireless communications

technology and impact the development of

the Brazilian telecommunications sector.

From the start, this research effort has

been supported by Ericsson Research

providing a dynamic environment where

academia and industry together can

address timely and relevant research

challenges. This book summarized much

of the research output that has resulted

from GTEL's efforts. It provides a

comprehensive treatment of the physical

and multiple access layers in mobile

communication systems describing

different generations of systems but with a

focus on 3G systems. The team of

Professor C-alcanti has contributed scienti-

cally to the development of this eld and

built up an impressive expertise. In the

chapters that follow, they share their

views and kno- edge on the underlying

principles and technical trade-offs when

designing the air interface of 3G systems.

The complexity of 3G systems and the

interaction between the physical and m-

ultiple access layers present a tremendous

challenge when modeling, designing, and

analyzing the mobile communication

system. Herein, the authors tackle this pr-

blem in an impressive manner. Their work is

very much in line with the developments

in 3GPP providing a deeper understanding

of the evolution of 3G and also future

enhancements.

OFDM for Wireless Multimedia

Communications Springer Science &

Business Media

Positioning in Wireless Communications Systems explains the principal differences and similarities of wireless communications systems and navigation systems. It discusses scenarios which are critical for dedicated navigation systems such as the Global Positioning System (GPS) and which motivate the use of positioning based on terrestrial wireless communication systems. The book introduces approaches for determination of parameters which are dependent on the position of the mobile terminal and also discusses iterative algorithms to estimate and track the position of the mobile terminal. Models for radio propagation and user mobility are important for performance investigations and assessments using computer simulations. Thus, channel and mobility models are explored, especially focussing on critical navigation environments like urban or indoor scenarios. Positioning in Wireless Communications Systems examines advanced algorithms such as hybrid data fusion of satellite navigation and positioning with wireless communications and cooperative positioning among mobile terminals.. The performance of the discussed positioning techniques are explored on the basis of already existing and operable terrestrial wireless communication systems such as GSM, UMTS, or LTE and it is shown how positioning issues are fixed in respective standards. Written by industry experts working at the cutting edge of technological development, the authors are well placed to give an excellent view on this topic, enabling in-depth coverage of current developments. Key features • Unique in its approach to dealing with a heterogeneous system approach, different

cell structures and signal proposals for future communications systems • Covers hybrid positioning investigating how GNSS and wireless communications positioning complement each other • Applications and exploitation of positioning information are discussed to show the benefits of including this information in several parts of a wireless communications system Wireless Communication Systems Academic Press
As a result of higher frequencies and increased user mobility, researchers and systems designers are shifting their focus from time-invariant models to channels that vary within a block. Wireless Communications Over Rapidly Time-Varying Channels explains the latest theoretical advances and practical methods to give an understanding of rapidly time varying channels, together with performance trade-offs and potential performance gains, providing the expertise to develop future wireless systems technology. As well as an overview of the issues of developing wireless systems using time-varying channels, the book gives extensive coverage to methods for estimating and equalizing rapidly time-varying channels, including a discussion of training data optimization, as well as providing models and transceiver methods for time-varying ultra-wideband channels. An introduction to time-varying channel models gives in a nutshell the important issues of developing wireless systems technology using time-varying channels Extensive coverage of methods for estimating and equalizing rapidly time-varying channels, including a discussion of training data optimization, enables development of high performance wireless systems Chapters on

transceiver design for OFDM and receiver algorithms for MIMO communication channels over time-varying channels, with an emphasis on modern iterative turbo-style architectures, demonstrates how these important technologies can optimize future wireless systems Wireless Communications River Publishers
MIMO-OFDM is a key technology for next-generation cellular communications (3GPP-LTE, Mobile WiMAX, IMT-Advanced) as well as wireless LAN (IEEE 802.11a, IEEE 802.11n), wireless PAN (MB-OFDM), and broadcasting (DAB, DVB, DMB). In MIMO-OFDM Wireless Communications with MATLAB®, the authors provide a comprehensive introduction to the theory and practice of wireless channel modeling, OFDM, and MIMO, using MATLAB® programs to simulate the various techniques on MIMO-OFDM systems. One of the only books in the area dedicated to explaining simulation aspects Covers implementation to help cement the key concepts Uses materials that have been classroom-tested in numerous universities Provides the analytic solutions and practical examples with downloadable MATLAB® codes Simulation examples based on actual industry and research projects Presentation slides with key equations and figures for instructor use MIMO-OFDM Wireless Communications with MATLAB® is a key text for graduate students in wireless communications. Professionals and technicians in wireless communication fields, graduate students in signal processing, as well as senior undergraduates majoring in wireless communications will find this book a practical introduction to the MIMO-OFDM techniques. Instructor materials and MATLAB® code examples available for download at www.wiley.com/go/chomimo