

Millimeter Wave Wireless Communications Theodore S

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Adaptive Antenna Arrays - Sathish Chandran 2013-03-09

This compilation of the works and insights of various key scientists and engineers in this area addresses the current and future trends of scenarios for employing adaptive antenna arrays in communication systems. Ideal as a quick reference for engineers, researchers, advanced undergraduate and postgraduate students.

Machine Learning for Future Wireless Communications - Fa-Long Luo 2020-02-10

A comprehensive review to the theory, application and research of machine learning for future wireless communications In one single volume, *Machine Learning for Future Wireless Communications* provides a comprehensive and highly accessible treatment to the theory, applications and current research developments to the technology aspects related to machine learning for wireless communications and networks. The technology development of machine learning for wireless communications has grown explosively and is one of the biggest trends in related academic, research and industry communities. Deep neural networks-based machine learning technology is a promising tool to attack the big challenge in wireless communications and networks imposed by the increasing demands in terms of capacity, coverage, latency, efficiency flexibility, compatibility, quality of experience and silicon convergence. The author - a noted expert on the topic - covers a wide range of topics including system architecture and optimization, physical-layer and cross-layer processing, air interface and protocol design, beamforming and antenna configuration, network coding and slicing, cell acquisition and handover, scheduling and rate adaption, radio access control, smart proactive caching and adaptive resource allocations. Uniquely organized into three categories: Spectrum Intelligence, Transmission Intelligence and Network Intelligence, this important resource: Offers a comprehensive review of the theory, applications and current developments of machine learning for wireless communications and networks Covers a range of topics from architecture and optimization to adaptive resource allocations Reviews state-of-the-art machine learning based solutions for network coverage Includes an overview of the applications of machine learning algorithms in future wireless networks Explores flexible backhaul and front-haul, cross-layer optimization and coding, full-duplex radio, digital front-end (DFE) and radio-frequency (RF) processing Written for professional engineers, researchers, scientists, manufacturers, network operators, software developers and graduate students, *Machine Learning for Future Wireless Communications* presents in 21 chapters a comprehensive review of the topic authored by an expert in the field.

Understanding LTE with MATLAB - Houman Zarrinkoub 2014-01-28

An introduction to technical details related to the Physical Layer of the LTE standard with MATLAB® The LTE (Long Term Evolution) and LTE-Advanced are among the latest mobile communications standards, designed to realize the dream of a truly global, fast, all-IP-based, secure broadband mobile access technology. This book examines the Physical Layer (PHY) of the LTE standards by incorporating three conceptual elements: an overview of the theory behind key enabling technologies; a concise discussion regarding standard specifications; and the MATLAB® algorithms needed to simulate the standard. The use of MATLAB®, a widely used technical computing language, is one of the distinguishing features of this book. Through a series of MATLAB® programs, the author explores each of the enabling technologies, pedagogically synthesizes an LTE PHY system model, and evaluates system performance at each stage. Following this step-by-step process, readers will achieve deeper understanding of LTE concepts and specifications through simulations. Key Features: • Accessible, intuitive, and progressive; one of the few books to focus primarily on the modeling,

simulation, and implementation of the LTE PHY standard • Includes case studies and testbenches in MATLAB®, which build knowledge gradually and incrementally until a functional specification for the LTE PHY is attained • Accompanying Web site includes all MATLAB® programs, together with PowerPoint slides and other illustrative examples Dr Houman Zarrinkoub has served as a development manager and now as a senior product manager with MathWorks, based in Massachusetts, USA. Within his 12 years at MathWorks, he has been responsible for multiple signal processing and communications software tools. Prior to MathWorks, he was a research scientist in the Wireless Group at Nortel Networks, where he contributed to multiple standardization projects for 3G mobile technologies. He has been awarded multiple patents on topics related to computer simulations. He holds a BSc degree in Electrical Engineering from McGill University and MSc and PhD degrees in Telecommunications from the Institut Nationale de la Recherche Scientifique, in Canada. [ahref="http://www.wiley.com/go/zarrinkoub"](http://www.wiley.com/go/zarrinkoub)www.wiley.com/go/zarrinkoub/a

Fundamentals of Wireless Communication - David Tse 2005-05-26

This textbook takes a unified view of the fundamentals of wireless communication and explains cutting-edge concepts in a simple and intuitive way. An abundant supply of exercises make it ideal for graduate courses in electrical and computer engineering and it will also be of great interest to practising engineers.

Communications, Signal Processing, and Systems - Qilian Liang 2019-05-04

This book brings together papers from the 2018 International Conference on Communications, Signal Processing, and Systems, which was held in Dalian, China on July 14–16, 2018. Presenting the latest developments and discussing the interactions and links between these multidisciplinary fields, the book spans topics ranging from communications, signal processing and systems. It is aimed at undergraduate and graduate electrical engineering, computer science and mathematics students, researchers and engineers from academia and industry as well as government employees.

Wireless Internet Of Things: Principles And Practice - Gyasi-agueyi Amoakoh 2020-04-22

Advanced Optical Wireless Communication Systems - Shlomi Arnon 2012-05-24

Combines theory with real-world case studies to give a comprehensive overview of modern optical wireless technology.

A Comprehensive Guide to 5G Security - Madhusanka Liyanage 2018-01-08

The first comprehensive guide to the design and implementation of security in 5G wireless networks and devices Security models for 3G and 4G networks based on Universal SIM cards worked very well. But they are not fully applicable to the unique security requirements of 5G networks. 5G will face additional challenges due to increased user privacy concerns, new trust and service models and requirements to support IoT and mission-critical applications. While multiple books already exist on 5G, this is the first to focus exclusively on security for the emerging 5G ecosystem. 5G networks are not only expected to be faster, but provide a backbone for many new services, such as IoT and the Industrial Internet. Those services will provide connectivity for everything from autonomous cars and UAVs to remote health monitoring through body-attached sensors, smart logistics through item tracking to remote diagnostics and preventive maintenance of equipment. Most services will be integrated with Cloud computing and novel concepts, such as mobile edge computing, which will require smooth and

transparent communications between user devices, data centers and operator networks. Featuring contributions from an international team of experts at the forefront of 5G system design and security, this book: Provides priceless insights into the current and future threats to mobile networks and mechanisms to protect it Covers critical lifecycle functions and stages of 5G security and how to build an effective security architecture for 5G based mobile networks Addresses mobile network security based on network-centricity, device-centricity, information-centricity and people-centricity views Explores security considerations for all relative stakeholders of mobile networks, including mobile network operators, mobile network virtual operators, mobile users, wireless users, Internet-of things, and cybersecurity experts Providing a comprehensive guide to state-of-the-art in 5G security theory and practice, A Comprehensive Guide to 5G Security is an important working resource for researchers, engineers and business professionals working on 5G development and deployment.

Signal Processing for 5G - Fa-Long Luo 2016-10-17

A comprehensive and invaluable guide to 5G technology, implementation and practice in one single volume. For all things 5G, this book is a must-read. Signal processing techniques have played the most important role in wireless communications since the second generation of cellular systems. It is anticipated that new techniques employed in 5G wireless networks will not only improve peak service rates significantly, but also enhance capacity, coverage, reliability, low-latency, efficiency, flexibility, compatibility and convergence to meet the increasing demands imposed by applications such as big data, cloud service, machine-to-machine (M2M) and mission-critical communications. This book is a comprehensive and detailed guide to all signal processing techniques employed in 5G wireless networks. Uniquely organized into four categories, New Modulation and Coding, New Spatial Processing, New Spectrum Opportunities and New System-level Enabling Technologies, it covers everything from network architecture, physical-layer (down-link and up-link), protocols and air interface, to cell acquisition, scheduling and rate adaptation, access procedures and relaying to spectrum allocations. All technology aspects and major roadmaps of global 5G standard development and deployments are included in the book. Key Features: Offers step-by-step guidance on bringing 5G technology into practice, by applying algorithms and design methodology to real-time circuit implementation, taking into account rapidly growing applications that have multi-standards and multi-systems. Addresses spatial signal processing for 5G, in particular massive multiple-input multiple-output (massive-MIMO), FD-MIMO and 3D-MIMO along with orbital angular momentum multiplexing, 3D beamforming and diversity. Provides detailed algorithms and implementations, and compares all multicarrier modulation and multiple access schemes that offer superior data transmission performance including FBMC, GFDM, F-OFDM, UFMC, SEFDM, FTN, MUSA, SCMA and NOMA. Demonstrates the translation of signal processing theories into practical solutions for new spectrum opportunities in terms of millimeter wave, full-duplex transmission and license assisted access. Presents well-designed implementation examples, from individual function block to system level for effective and accurate learning. Covers signal processing aspects of emerging system and network architectures, including ultra-dense networks (UDN), software-defined networks (SDN), device-to-device (D2D) communications and cloud radio access network (C-RAN).

Smart Antennas with MATLAB, Second Edition - Frank Gross 2015-04-22

The most complete, current guide to smart antenna design and performance Featuring new coverage of reconfigurable antennas, vector antennas, and direction-finding antennas, this up-to-date resource offers a rigorous review of the basic electromagnetic principles that drive smart antenna design and deployment. Case studies and worked examples using MATLAB are provided. End-of-chapter assignments reinforce the concepts presented. Thoroughly revised to reflect recent developments and the latest technologies, this is a comprehensive reference for all professionals, students, and researchers in the field of smart antennas. Smart Antennas with MATLAB, Second Edition, covers: Fundamentals of electromagnetic fields Antenna fundamentals Array fundamentals Principles of random variables and processes Propagation channel characteristics Angle-of-arrival estimation Smart antennas Direction finding Electromagnetic vector sensors Smart antenna design and optimization

Millimeter Wave Wireless Communications - Theodore S. Rappaport 2015

The Definitive, Comprehensive Guide to Cutting-Edge Millimeter Wave

Wireless Design "This is a great book on mmWave systems that covers many aspects of the technology targeted for beginners all the way to the advanced users. The authors are some of the most credible scholars I know of who are well respected by the industry. I highly recommend studying this book in detail." —Ali Sadri, Ph.D., Sr. Director, Intel Corporation, MCG mmWave Standards and Advanced Technologies Millimeter wave (mmWave) is today's breakthrough frontier for emerging wireless mobile cellular networks, wireless local area networks, personal area networks, and vehicular communications. In the near future, mmWave products, systems, theories, and devices will come together to deliver mobile data rates thousands of times faster than today's existing cellular and WiFi networks. In Millimeter Wave Wireless Communications, four of the field's pioneers draw on their immense experience as researchers, entrepreneurs, inventors, and consultants, empowering engineers at all levels to succeed with mmWave. They deliver exceptionally clear and useful guidance for newcomers, as well as the first complete desk reference for design experts. The authors explain mmWave signal propagation, mmWave circuit design, antenna designs, communication theory, and current standards (including IEEE 802.15.3c, Wireless HD, and ECMA/WiMedia). They cover comprehensive mmWave wireless design issues, for 60 GHz and other mmWave bands, from channel to antenna to receiver, introducing emerging design techniques that will be invaluable for research engineers in both industry and academia. Topics include Fundamentals: communication theory, channel propagation, circuits, antennas, architectures, capabilities, and applications Digital communication: baseband signal/channel models, modulation, equalization, error control coding, multiple input multiple output (MIMO) principles, and hardware architectures Radio wave propagation characteristics: indoor and outdoor applications Antennas/antenna arrays, including on-chip and in-package antennas, fabrication, and packaging Analog circuit design: mmWave transistors, fabrication, and transceiver design approaches Baseband circuit design: multi-gigabit-per-second, high-fidelity DAC and ADC converters Physical layer: algorithmic choices, design considerations, and impairment solutions; and how to overcome clipping, quantization, and nonlinearity Higher-layer design: beam adaptation protocols, relaying, multimedia transmission, and multiband considerations 60 GHz standardization: IEEE 802.15.3c for WPAN, Wireless HD, ECMA-387, IEEE 802.11ad, Wireless Gigabit Alliance (WiGig)

MIMO-OFDM Wireless Communications with MATLAB - Yong Soo Cho 2010-08-20

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

Millimeter-Wave Wireless Communication Systems - Chia-Chin Chong 2006-12-01

Enabling Technologies for Next Generation Wireless Communications - Mohammed Usman 2020-12-29

Enabling Technologies for Next Generation Wireless Communications provides up-to-date information on emerging trends in wireless systems, their enabling technologies and their evolving application paradigms. This book includes the latest trends and developments toward next generation wireless communications. It highlights the requirements of next generation wireless systems, limitations of existing technologies in delivering those requirements and the need to develop radical new technologies. It focuses on bringing together information on various

technological developments that are enablers vital to fulfilling the requirements of future wireless communication systems and their applications. Topics discussed include spectrum issues, network planning, signal processing, transmitter, receiver, antenna technologies, channel coding, security and application of machine learning and deep learning for wireless communication systems. The book also provides information on enabling business models for future wireless systems. This book is useful as a resource for researchers and practitioners worldwide, including industry practitioners, technologists, policy decision-makers, academicians, and graduate students.

5G System Design - Patrick Marsch 2018-03-28

This book provides a comprehensive overview of the latest research and standardization progress towards the 5th generation (5G) of mobile communications technology and beyond. It covers a wide range of topics from 5G use cases and their requirements, to spectrum, 5G end-to-end (E2E) system architecture including core network (CN), transport network (TN) and radio access network (RAN) architecture, network slicing, security and network management. It further dives into the detailed functional design and the evaluation of different 5G concepts, and provides details on planned trials and pre-commercial deployments across the globe. While the book naturally captures the latest agreements in 3rd Generation Partnership Project (3GPP) New Radio (NR) Release 15, it goes significantly beyond this by describing the likely developments towards the final 5G system that will ultimately utilize a wide range of spectrum bands, address all envisioned 5G use cases, and meet or exceed the International Mobile Telecommunications (IMT) requirements for the year 2020 and beyond (IMT-2020). em style="mso-bidi-font-style: normal;"5G System Design: Architectural and Functional Considerations and Long Term Research is based on the knowledge and consensus from 158 leading researchers and standardization experts from 54 companies or institutes around the globe, representing key mobile network operators, network vendors, academic institutions and regional bodies for 5G. Different from earlier books on 5G, it does not focus on single 5G technology components, but describes the full 5G system design from E2E architecture to detailed functional design, including details on 5G performance, implementation and roll-out.

6G Wireless Communications and Mobile Networking - Xianzhong Xie 2021-05-31

6G Wireless Communications and Mobile Networking introduces the key technologies behind 6G wireless communication and mobile networking to the reader. The book starts with a general vision of 6G technology, which includes the motivation that drives 6G research, the international organizations working on 6G standardization and recent progress in 6G research. Separate chapters on millimeter-wave and terahertz-wave technologies in 6G, the development of latest 6G antenna technology as well as related wireless communication applications are included in the contents. The book also provides details about the 6G network layer, such as self-organizing network driven by network slicing, software-defined networking and network function virtualization. Finally, it covers some popular research topics, including the challenges and solutions to massive 6G IoT networks, 6G cloud/edge computing and big data systems that may appear in the foreseeable future. Key Features: - Provides a complete introduction to 6G vision and technology - Consists of both basic theories and frontier technologies - Separate chapters on key topics such as 6G physical layers, millimeter wave and terahertz technology and advanced antenna arrays - Covers future trends and applications such as intelligent management systems, 6G IoT networks, cloud/edge computing and big data applications This focused reference will significantly enhance the knowledge of engineering students and apprentices involved in the field of telecommunications. Readers interested in cutting-edge wireless networking technologies will also benefit from the information provided.

Wireless Communications - Theodore S. Rappaport 1996

Building on his classic edition, Rappaport covers the fundamental issues impacting all wireless networks and reviews virtually every important new wireless standard and technological development. He illustrates each key concept with practical examples, thoroughly explained and solved step by step.

mmWave Massive MIMO - Shahid Mumtaz 2016-12-02

mmWave Massive MIMO: A Paradigm for 5G is the first book of its kind to hinge together related discussions on mmWave and Massive MIMO under the umbrella of 5G networks. New networking scenarios are identified, along with fundamental design requirements for mmWave Massive MIMO networks from an architectural and practical perspective. Working towards final deployment, this book updates the research

community on the current mmWave Massive MIMO roadmap, taking into account the future emerging technologies emanating from 3GPP/IEEE. The book's editors draw on their vast experience in international research on the forefront of the mmWave Massive MIMO research arena and standardization. This book aims to talk openly about the topic, and will serve as a useful reference not only for postgraduates students to learn more on this evolving field, but also as inspiration for mobile communication researchers who want to make further innovative strides in the field to mark their legacy in the 5G arena. Contains tutorials on the basics of mmWave and Massive MIMO Identifies new 5G networking scenarios, along with design requirements from an architectural and practical perspective Details the latest updates on the evolution of the mmWave Massive MIMO roadmap, considering future emerging technologies emanating from 3GPP/IEEE Includes contributions from leading experts in the field in modeling and prototype design for mmWave Massive MIMO design Presents an ideal reference that not only helps postgraduate students learn more in this evolving field, but also inspires mobile communication researchers towards further innovation

5G Explained - Jyrki T. J. Penttinen 2019-03-07

Practical Guide Provides Students and Industry Professionals with Latest Information on 5G Mobile Networks Continuing the tradition established in his previous publications, Jyrki Penttinen offers 5G Explained as a thorough yet concise introduction to recent advancements and growing trends in mobile telecommunications. In this case, Penttinen focuses on the development and employment of 5G mobile networks and, more specifically, the challenges inherent in adjusting to new global standardization requirements and in maintaining a high level of security even as mobile technology expands to new horizons. The text discusses, for example, the Internet of Things (IoT) and how to keep networks reliable and secure when they are constantly accessed by many different devices with varying levels of user involvement and competence. 5G Explained is primarily designed for specialists who need rapid acclimation to the possibilities and concerns presented by 5G adoption. Therefore, it assumes some prior knowledge of mobile communications. However, earlier chapters are structured so that even relative newcomers will gain useful information. Other notable features include: Three modules each consisting of three chapters: Introduction, Technical Network Description and Planning of Security and Deployment Comprehensive coverage of topics such as technical requirements for 5G, network architecture, radio and core networks and services/applications Discussion of specific security techniques in addition to common-sense guidelines for planning, deploying, managing and optimizing 5G networks 5G Explained offers crucial updates for anyone involved in designing, deploying or working with 5G networks. It should prove a valuable guide for operators, equipment manufacturers and other professionals in mobile equipment engineering and security, network planning and optimization, and mobile application development, or anyone looking to break into these fields.

Foundations of MIMO Communication - Robert W. Heath Jr. 2018-12-06

An accessible, comprehensive and coherent treatment of MIMO communication, drawing on ideas from information theory and signal processing.

Introduction to Wireless Digital Communication - Robert W. Heath Jr. 2017-04-04

The Accessible Guide to Modern Wireless Communication for Undergraduates, Graduates, and Practicing Electrical Engineers Wireless communication is a critical discipline of electrical engineering and computer science, yet the concepts have remained elusive for students who are not specialists in the area. This text makes digital communication and receiver algorithms for wireless communication broadly accessible to undergraduates, graduates, and practicing electrical engineers. Notably, the book builds on a signal processing foundation and does not require prior courses on analog or digital communication. Introduction to Wireless Digital Communication establishes the principles of communication, from a digital signal processing perspective, including key mathematical background, transmitter and receiver signal processing algorithms, channel models, and generalizations to multiple antennas. Robert Heath's "less is more" approach focuses on typical solutions to common problems in wireless engineering. Heath presents digital communication fundamentals from a signal processing perspective, focusing on the complex pulse amplitude modulation approach used in most commercial wireless systems. He describes specific receiver algorithms for implementing wireless communication links, including synchronization, carrier frequency offset

estimation, channel estimation, and equalization. While most concepts are presented for systems with single transmit and receive antennas, Heath concludes by extending those concepts to contemporary MIMO systems. To promote learning, each chapter includes previews, bullet-point summaries, examples, and numerous homework problems to help readers test their knowledge. Basics of wireless communication: applications, history, and the central role of signal processing Digital communication essentials: components, channels, distortion, coding/decoding, encryption, and modulation/demodulation Signal processing: linear time invariant systems, probability/random processes, Fourier transforms, derivation of complex baseband signal representation and equivalent channels, and multi-rate signal processing Least-squared estimation techniques that build on the linear algebra typically taught to electrical engineering undergraduates Complex pulse amplitude modulation: symbol mapping, constellations, signal bandwidth, and noise Synchronization, including symbol, frame, and carrier frequency offset Frequency selective channel estimation and equalization MIMO techniques using multiple transmit and/or receive antennas, including SIMO, MISO, and MIMO-OFDM Register your product at informit.com/register for convenient access to downloads, updates, and corrections as they become available.

Inclusive Radio Communications for 5G and Beyond - Claude Oestges 2021-05-18

Inclusive Radio Communication Networks for 5G and Beyond is based on the COST IRACON project that consists of 500 researchers from academia and industry, with 120 institutions from Europe, US and the Far East involved. The book presents state-of-the-art design and analysis methods for 5G (and beyond) radio communication networks, along with key challenges and issues related to the development of 5G networks. Covers the latest research on 5G networks - including propagation, localization, IoT and radio channels Based on the International COST research project, IRACON, with 120 institutions and 500 researchers from Europe, US and the Far East involved Provides coverage of IoT protocols, architectures and applications, along with IoT applications in healthcare Contains a concluding chapter on future trends in mobile communications and networking

Wireless Communications: Principles And Practice, 2/E - Theodore S. Rappaport 2010-09

[Introduction to Wireless and Mobile Systems](#) - Dharma P. Agrawal 2010-06-10

This text explains the general principles of how wireless systems work, how mobility is supported, what the underlying infrastructure is and what interactions are needed among different functional components. Designed as a textbook appropriate for undergraduate or graduate courses in Computer Science (CS), Computer Engineering (CE), and Electrical Engineering (EE), Introduction to Wireless and Mobile Systems third edition focuses on qualitative descriptions and the realistic explanations of relationships between wireless systems and performance parameters. Rather than offering a thorough history behind the development of wireless technologies or an exhaustive list of work being carried out, the authors help CS, CE, and EE students learn this exciting technology through relevant examples such as understanding how a cell phone starts working as soon as they get out of an airplane. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Optical Wireless Communications - Murat Uysal 2016-08-25

This book focuses on optical wireless communications (OWC), an emerging technology with huge potential for the provision of pervasive and reliable next-generation communications networks. It shows how the development of novel and efficient wireless technologies can contribute to a range of transmission links essential for the heterogeneous networks of the future to support various communications services and traffic patterns with ever-increasing demands for higher data-transfer rates. The book starts with a chapter reviewing the OWC field, which explains different sub-technologies (visible-light, ultraviolet (UV) and infrared (IR) communications) and introduces the spectrum of application areas (indoor, vehicular, terrestrial, underwater, intersatellite, deep space, etc.). This provides readers with the necessary background information to understand the specialist material in the main body of the book, which is in four parts. The first of these deals with propagation modelling and channel characterization of OWC channels at different spectral bands and with different applications. The second starts by providing a unified information-theoretic treatment of OWC and then discusses advanced physical-layer methodologies (including, but not limited to: advanced

coding, modulation diversity, cooperation and multi-carrier techniques) and the ultimate limitations imposed by practical constraints. On top of the physical layer come the upper-layer protocols and cross-layer designs that are the subject of the third part of the book. The last part of the book features a chapter-by-chapter assessment of selected OWC applications. Optical Wireless Communications is a valuable reference guide for academic researchers and practitioners concerned with the future development of the world's communication networks. It succinctly but comprehensively presents the latest advances in the field.

Radio Propagation Measurements and Channel Modeling: Best Practices for Millimeter-Wave and Sub-Terahertz Frequencies - Theodore S. Rappaport 2022-08-31

This book offers comprehensive, practical guidance on RF propagation channel characterization at mmWave and sub-terahertz frequencies, with an overview of both measurement systems and current and future channel models. It introduces the key concepts required for performing accurate mmWave channel measurements, including channel sounder architectures, calibration methods, channel sounder performance metrics and their relationship to propagation channel characteristics. With a comprehensive introduction to mmWave channel models, the book allows readers to carefully review and select the most appropriate channel model for their application. The book provides fundamental system theory accessible in a step by step way with clear examples throughout. With inter- and multidisciplinary perspectives, the reader will observe the tight interaction between measurements and modeling for these frequency bands and how different disciplines interact. This is an excellent reference for researchers, including graduate students, working on mmWave and sub-THz wireless communications, and for engineers developing communication systems.

RF and Microwave Engineering - Frank Gustrau 2012-06-22

This book provides a fundamental and practical introduction to radio frequency and microwave engineering and physical aspects of wireless communication In this book, the author addresses a wide range of radio-frequency and microwave topics with emphasis on physical aspects including EM and voltage waves, transmission lines, passive circuits, antennas, radio wave propagation. Up-to-date RF design tools like RF circuit simulation, EM simulation and computerized smith charts, are used in various examples to demonstrate how these methods can be applied effectively in RF engineering practice. Design rules and working examples illustrate the theoretical parts. The examples are close to real world problems, so the reader can directly transfer the methods within the context of their own work. At the end of each chapter a list of problems is given in order to deepen the reader's understanding of the chapter material and practice the new competences. Solutions are available on the author's website. Key Features: Presents a wide range of RF topics with emphasis on physical aspects e.g. EM and voltage waves, transmission lines, passive circuits, antennas Uses various examples of modern RF tools that show how the methods can be applied productively in RF engineering practice Incorporates various design examples using circuit and electromagnetic (EM) simulation software Discusses the propagation of waves: their representation, their effects, and their utilization in passive circuits and antenna structures Provides a list of problems at the end of each chapter Includes an accompanying website containing solutions to the problems (http://www.fh-dortmund.de/gustrau_rf_textbook) This will be an invaluable textbook for bachelor and masters students on electrical engineering courses (microwave engineering, basic circuit theory and electromagnetic fields, wireless communications). Early-stage RF practitioners, engineers (e.g. application engineer) working in this area will also find this book of interest.

Python for Programmers - Paul J. Deitel 2019-03-15

The professional programmer's Deitel® guide to Python® with introductory artificial intelligence case studies Written for programmers with a background in another high-level language, Python for Programmers uses hands-on instruction to teach today's most compelling, leading-edge computing technologies and programming in Python—one of the world's most popular and fastest-growing languages. Please read the Table of Contents diagram inside the front cover and the Preface for more details. In the context of 500+, real-world examples ranging from individual snippets to 40 large scripts and full implementation case studies, you'll use the interactive IPython interpreter with code in Jupyter Notebooks to quickly master the latest Python coding idioms. After covering Python Chapters 1-5 and a few key parts of Chapters 6-7, you'll be able to handle significant portions of the hands-on introductory AI case studies in Chapters 11-16, which are

loaded with cool, powerful, contemporary examples. These include natural language processing, data mining Twitter® for sentiment analysis, cognitive computing with IBM® Watson™, supervised machine learning with classification and regression, unsupervised machine learning with clustering, computer vision through deep learning and convolutional neural networks, deep learning with recurrent neural networks, big data with Hadoop®, Spark™ and NoSQL databases, the Internet of Things and more. You'll also work directly or indirectly with cloud-based services, including Twitter, Google Translate™, IBM Watson, Microsoft® Azure®, OpenMapQuest, PubNub and more. Features 500+ hands-on, real-world, live-code examples from snippets to case studies IPython + code in Jupyter® Notebooks Library-focused: Uses Python Standard Library and data science libraries to accomplish significant tasks with minimal code Rich Python coverage: Control statements, functions, strings, files, JSON serialization, CSV, exceptions Procedural, functional-style and object-oriented programming Collections: Lists, tuples, dictionaries, sets, NumPy arrays, pandas Series & DataFrames Static, dynamic and interactive visualizations Data experiences with real-world datasets and data sources Intro to Data Science sections: AI, basic stats, simulation, animation, random variables, data wrangling, regression AI, big data and cloud data science case studies: NLP, data mining Twitter®, IBM® Watson™, machine learning, deep learning, computer vision, Hadoop®, Spark™, NoSQL, IoT Open-source libraries: NumPy, pandas, Matplotlib, Seaborn, Folium, SciPy, NLTK, TextBlob, spaCy, Textastic, Tweepy, scikit-learn®, Keras and more Accompanying code examples are available here:

http://ptgmedia.pearsoncmg.com/imprint_downloads/informit/bookreg/9780135224335/9780135224335_examples.zip. Register your product for convenient access to downloads, updates, and/or corrections as they become available. See inside book for more information.

Systems Engineering of Phased Arrays - Rick Sturdivant 2018-11-30 Phased arrays, while traditionally used in radar systems, are now being used or proposed for use in internet of things (IoT) networks, high-speed back haul communication, terabit-per-second satellite systems, 5G mobile networks, and mobile phones. This book considers systems engineering of phased arrays and addresses not only radar, but also these modern applications. It presents a system-level perspective and approach that is essential for the successful development of modern phased arrays. Using practical examples, this book helps solve problems often encountered by technical professionals. Thermal management challenges, antenna element design issues, and architectures solutions are explored as well as the benefits and challenges of digital beam forming. This book provides the information required to train engineers to design and develop phased arrays and contains questions at the end of each chapter that professors will find useful for instruction.

Advanced Antenna Systems for 5G Network Deployments - Henrik Asplund 2020-06-24

Advanced Antenna Systems for 5G Network Deployments: Bridging the Gap between Theory and Practice provides a comprehensive understanding of the field of advanced antenna systems (AAS) and how they can be deployed in 5G networks. The book gives a thorough understanding of the basic technology components, the state-of-the-art multi-antenna solutions, what support 3GPP has standardized together with the reasoning, AAS performance in real networks, and how AAS can be used to enhance network deployments. Explains how AAS features impact network performance and how AAS can be effectively used in a 5G network, based on either NR and/or LTE Shows what AAS configurations and features to use in different network deployment scenarios, focusing on mobile broadband, but also including fixed wireless access Presents the latest developments in multi-antenna technologies, including Beamforming, MIMO and cell shaping, along with the potential of different technologies in a commercial network context Provides a deep understanding of the differences between mid-band and mm-Wave solutions

Satellite Communications Systems - Gerard Maral 2020-02-03

The revised and updated sixth edition of em style="mso-bidi-font-style: normal;" Satellite Communications Systems contains information on the most recent advances related to satellite communications systems, technologies, network architectures and new requirements of services and applications. The authors - noted experts on the topic - cover the state-of-the-art satellite communication systems and technologies and examine the relevant topics concerning communication and network technologies, concepts, techniques and algorithms. New to this edition is information on internetworking with the broadband satellite systems, more intensive coverage of Ka band technologies, GEO high throughput

satellite (HTS), LEO constellations and the potential to support the current new broadband Internet services as well as future developments for global information infrastructure. The authors offer details on digital communication systems and broadband networks in order to provide high-level researchers and professional engineers an authoritative reference. The companion website provides slides for instructors to teach and for students to learn. In addition, the book is designed in a user-friendly format.

Wireless Communications - Andreas F. Molisch 2012-02-06

"Professor Andreas F. Molisch, renowned researcher and educator, has put together the comprehensive book, Wireless Communications. The second edition, which includes a wealth of new material on important topics, ensures the role of the text as the key resource for every student, researcher, and practitioner in the field." —Professor Moe Win, MIT, USA Wireless communications has grown rapidly over the past decade from a niche market into one of the most important, fast moving industries. Fully updated to incorporate the latest research and developments, Wireless Communications, Second Edition provides an authoritative overview of the principles and applications of mobile communication technology. The author provides an in-depth analysis of current treatment of the area, addressing both the traditional elements, such as Rayleigh fading, BER in flat fading channels, and equalisation, and more recently emerging topics such as multi-user detection in CDMA systems, MIMO systems, and cognitive radio. The dominant wireless standards; including cellular, cordless and wireless LANs; are discussed. Topics featured include: wireless propagation channels, transceivers and signal processing, multiple access and advanced transceiver schemes, and standardised wireless systems. Combines mathematical descriptions with intuitive explanations of the physical facts, enabling readers to acquire a deep understanding of the subject. Includes new chapters on cognitive radio, cooperative communications and relaying, video coding, 3GPP Long Term Evolution, and WiMax; plus significant new sections on multi-user MIMO, 802.11n, and information theory. Companion website featuring: supplementary material on 'DECT', solutions manual and presentation slides for instructors, appendices, list of abbreviations and other useful resources.

History of Wireless - T. K. Sarkar 2006-01-30

Important new insights into how various components and systemsevolved Premised on the idea that one cannot know a science withoutknowing its history, History of Wireless offers a lively newtreatment that introduces previously unacknowledged pioneers anddevelopments, setting a new standard for understanding theeolution of this important technology. Starting with the background-magnetism, electricity, light, andMaxwell's Electromagnetic Theory-this book offers new insights intothe initial theory and experimental exploration of wireless. Inaddition to the well-known contributions of Maxwell, Hertz, andMarconi, it examines work done by Heaviside, Tesla, and passionateamateurs such as the Kentucky melon farmer Nathan Stubblefield andthe unsung hero Antonio Meucci. Looking at the story frommathematical, physics, technical, and other perspectives, theclearly written text describes the development of wireless within avivid scientific milieu. History of Wireless also goes into other key areas,including: The work of J. C. Bose and J. A. Fleming German, Japanese, and Soviet contributions to physics andapplications of electromagnetic oscillations and waves Wireless telegraphic and telephonic development and attempts toachieve transatlantic wireless communications Wireless telegraphy in South Africa in the early twentiethcentury Antenna development in Japan: past and present Soviet quasi-optics at near-mm and sub-mm wavelengths The evolution of electromagnetic waveguides The history of phased array antennas Augmenting the typical, Marconi-centered approach, History ofWireless fills in the conventionally accepted story withattention to more specific, less-known discoveries and individuals,and challenges traditional assumptions about the origins and growthof wireless. This allows for a more comprehensive understanding ofhow various components and systems evolved. Written in a clear tonewith a broad scientific audience in mind, this exciting andthorough treatment is sure to become a classic in the field.

Circuits and Systems for Wireless Communications - Markus Helfenstein 2007-05-08

Part I: RF System Integration. 1. RF System Integration; C. Toumazou. 2. RF System Board Level Integration for Mobile Phones; G.J. Aspin. 3. Integration of RF Systems on a Chip; P.J. Mole. 4. Towards the Full Integration of Wireless Front-End Circuits; M. Steyaert. 5. GSM Transceiver Front-End Circuits in 0.25 mum CMOS; Q. Huang, et al. Part II: RF Front-End Circuits. 6. RF Front-End Circuits; Q. Huang. 7. Phase-

Noise-to-Carrier Ratio in LC Oscillators; Q. Huang. 8. Design Study of a 900 MHz/1.8 GHz CMOS Transceiver for Dual-Band Applications; B. Razavi. 9. Integrated Wireless Transc.

Mobile and Wireless Communications - Salma Ait Fares 2010-01-01

Mobile and wireless communications applications have a clear impact on improving the humanity wellbeing. From cell phones to wireless internet to home and office devices, most of the applications are converted from wired into wireless communication. Smart and advanced wireless communication environments represent the future technology and evolutionary development step in homes, hospitals, industrial, vehicular and transportation systems. A very appealing research area in these environments has been the wireless ad hoc, sensor and mesh networks. These networks rely on ultra low powered processing nodes that sense surrounding environment temperature, pressure, humidity, motion or chemical hazards, etc. Moreover, the radio frequency (RF) transceiver nodes of such networks require the design of transmitter and receiver equipped with high performance building blocks including antennas, power and low noise amplifiers, mixers and voltage controlled oscillators. Nowadays, the researchers are facing several challenges to design such building blocks while complying with ultra low power consumption, small area and high performance constraints. CMOS technology represents an excellent candidate to facilitate the integration of the whole transceiver on a single chip. However, several challenges have to be tackled while designing and using nanoscale CMOS technologies and require innovative idea from researchers and circuits designers. While major researchers and applications have been focusing on RF wireless communication, optical wireless communication based system has started to draw some attention from researchers for a terrestrial system as well as for aerial and satellite terminals. This renewed interested in optical wireless communications is driven by several advantages such as no licensing requirements policy, no RF radiation hazards, and no need to dig up roads besides its large bandwidth and low power consumption. This second part of the book, *Mobile and Wireless Communications: Key Technologies and Future Applications*, covers the recent development in ad hoc and sensor networks, the implementation of state of the art of wireless transceivers building blocks and recent development on optical wireless communication systems. We hope that this book will be useful for students, researchers and practitioners in their research studies.

Aperture Antennas for Millimeter and Sub-Millimeter Wave Applications - Artem Boriskin 2017-09-05

This book presents the technology of millimetre waves and Terahertz (THz) antennas. It highlights the importance of moderate and high-gain aperture antennas as key devices for establishing point-to-point and point-to-multipoint radio links for far-field and near-field applications, such as high data-rate communications, intelligent transport, security imaging, exploration and surveillance systems. The book provides a comprehensive overview of the key antenna technologies developed for the mm wave and THz domains, including established ones - such as integrated lens antennas, advanced 2D and 3D horn antennas, transmit and reflect arrays, and Fabry-Perot antennas - as well as emerging metasurface antennas for near-field and far-field applications. It describes the pros and cons of each antenna technology in comparison with other available solutions, a discussion supplemented by practical examples illustrating the step-by-step implementation procedures for each antenna type. The measurement techniques available at these frequency ranges are also presented to close the loop of the antenna development cycle. In closing, the book outlines future trends in various antenna technologies, paving the way for further developments. Presenting content originating from the five-year ESF research networking program 'Newfocus' and co-authored by the most active and highly cited research groups in the domain of mm- and sub-mm-wave antenna technologies, the book offers a valuable guide for researchers and engineers in both industry and academia.

Millimeter-Wave Circuits for 5G and Radar - Gernot Hueber 2019-06-20
Discover the concepts and techniques needed to design millimeter-wave circuits for current and emerging wireless system applications.

5G for the Connected World - Devaki Chandramouli 2019-04-29

Comprehensive Handbook Demystifies 5G for Technical and Business Professionals in Mobile Telecommunication Fields Much is being said regarding the possibilities and capabilities of the emerging 5G technology, as the evolution towards 5G promises to transform entire industries and many aspects of our society. 5G for the Connected World offers a comprehensive technical overview that telecommunication professionals need to understand and take advantage of these

developments. The book offers a wide-ranging coverage of the technical aspects of 5G (with special consideration of the 3GPP Release 15 content), how it enables new services and how it differs from LTE. This includes information on potential use cases, aspects of radio and core networks, spectrum considerations and the services primarily driving 5G development and deployment. The text also looks at 5G in relation to the Internet of Things, machine to machine communication and technical enablers such as LTE-M, NB-IoT and EC-GSM. Additional chapters discuss new business models for telecommunication service providers and vertical industries as a result of introducing 5G and strategies for staying ahead of the curve. Other topics include: Key features of the new 5G radio such as descriptions of new waveforms, massive MIMO and beamforming technologies as well as spectrum considerations for 5G radio regarding all possible bands Drivers, motivations and overview of the new 5G system - especially RAN architecture and technology enablers (e.g. service-based architecture, compute-storage split and network exposure) for native cloud deployments Mobile edge computing, Non-3GPP access, Fixed-Mobile Convergence Detailed overview of mobility management, session management and Quality of Service frameworks 5G security vision and architecture Ultra-low latency and high reliability use cases and enablers, challenges and requirements (e.g. remote control, industrial automation, public safety and V2X communication) An outline of the requirements and challenges imposed by massive numbers of devices connected to cellular networks While some familiarity with the basics of 3GPP networks is helpful, 5G for the Connected World is intended for a variety of readers. It will prove a useful guide for telecommunication professionals, standardization experts, network operators, application developers and business analysts (or students working in these fields) as well as infrastructure and device vendors looking to develop and integrate 5G into their products, and to deploy 5G radio and core networks.

Millimeter-Wave Networks - Peng Yang 2021-10-27

This book provides a comprehensive review and in-depth study on efficient beamforming design and rigorous performance analysis in mmWave networks, covering beam alignment, beamforming training and beamforming-aided caching. Due to significant beam alignment latency between the transmitter and the receiver in existing mmWave systems, this book proposes a machine learning based beam alignment algorithm for mmWave networks to determine the optimal beam pair with a low latency. Then, to analyze and enhance the performance of beamforming training (BFT) protocol in 802.11ad mmWave networks, an analytical model is presented to evaluate the performance of BFT protocol and an enhancement scheme is proposed to improve its performance in high user density scenarios. Furthermore, it investigates the beamforming-aided caching problem in mmWave networks, and proposes a device-to-device assisted cooperative edge caching to alleviate backhaul congestion and reduce content retrieval delay. This book concludes with future research directions in the related fields of study. The presented beamforming designs and the corresponding research results covered in this book, provides valuable insights for practical mmWave network deployment and motivate new ideas for future mmWave networking. This book targets researchers working in the fields of mmWave networks, beamforming design, and resource management as well as graduate students studying the areas of electrical engineering, computing engineering and computer science. Professionals in industry who work in this field will find this book useful as a reference.

Wireless Communications - Andrea Goldsmith 2005-08-08

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.