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Multifunctional MIMO Antennas: Fundamentals and Application - Yadwinder Kumar 2022-05-20
This book presents a comprehensive approach to antenna designs for various applications, including 5G communication, the internet of things (IoT), and wearable devices. It discusses models, designs, and developments of MIMO antennas, antenna performance measurement, 5G communication challenges and opportunities, and MIMO antennas for LTE/ISM applications. It covers important topics including mmWave antennas, antenna

arrays for MIMO applications, reconfigurable/band-notched MIMO antennas, multiband MIMO antennas, wideband MIMO antennas, and fractal-based compact multiband hybrid antennas. FEATURES Discusses antenna design optimization techniques in detail Covers MIMOI antenna performance measurement, multiband MIMO antennas, and wideband MIMO antennas Discusses modeling, simulation, and specific absorption rate (SAR) analysis of antennas Provides applications including radio-frequency identification (RFID), wearable antennas, and antennas for IoT Multifunctional MIMO Antennas: Fundamentals and Application is useful for undergraduate and graduate students and academic researchers in areas including electrical engineering, electronics, and communication engineering.

Information Theory for Data Communications and Processing - Shlomo Shamai (Shitz) 2021-01-13

Modern, current, and future communications/processing aspects motivate basic information-theoretic research for a wide variety of systems for which we do not have the ultimate theoretical solutions (for example, a variety of problems in network information theory as the broadcast/interference and relay channels, which mostly remain unsolved in terms of determining capacity regions and the like). Technologies such as 5/6G cellular communications, Internet of Things (IoT), and mobile edge networks, among others, not only require reliable rates of information measured by the relevant capacity and capacity regions, but are also subject to issues such as latency vs. reliability, availability of system state information, priority of information, secrecy demands, energy consumption per mobile equipment, sharing of communications resources (time/frequency/space), etc. This book, composed of a collection of papers that have appeared in the Special Issue

of the Entropy journal dedicated to "Information Theory for Data Communications and Processing", reflects, in its eleven chapters, novel contributions based on the firm basic grounds of information theory. The book chapters address timely theoretical and practical aspects that constitute both interesting and relevant theoretical contributions, as well as direct implications for modern current and future communications systems.

Recent Technical Developments in Energy-Efficient 5G Mobile Cells - Raed A. Abd-Alhameed 2020-06-17 This book addresses the true innovation in engineering design that may be promoted by blending together models and methodologies from different disciplines, and, in this book, the target was exactly to follow this approach to deliver a new disruptive architecture to deliver these next-generation mobile small cell technologies. According to this design philosophy, the work within this book resides in the intersection of engineering paradigms that includes "cooperation", "network coding", and "smart energy-aware frontends". These technologies will not only be considered as individual building blocks, but re-engineered according to an inter-design approach resulting in the enabler for energy efficient femtocell-like services on the move. The book aims to narrow the gap between the current networking technologies and the foreseen requirements that are targeted at the future development of the 5G mobile and wireless communications networks in terms of the higher networking capacity, the ability to support more users, the lower cost per bit, the enhanced energy efficiency, and adaptability to new services and devices (for example, smart cities, and the Internet of things (IoT)).

Machine Learning and Cognitive Computing for Mobile Communications and Wireless Networks - Krishna

Kant Singh 2020-07-08 Communication and network technology has witnessed recent rapid development and numerous information services and applications have been developed globally. These technologies have high impact on society and the way people are leading their lives. The advancement in technology has undoubtedly improved the quality of service and user experience yet a lot needs to be still done. Some areas that still need improvement include seamless wide-area coverage, high-capacity hot-spots, low-power massive-connections, low-latency and high-reliability and so on. Thus, it is highly desirable to develop smart technologies for communication to improve the overall services and management of wireless communication. Machine learning and cognitive computing have converged to give some groundbreaking solutions for smart machines. With these two technologies coming together, the machines can acquire the ability to reason similar to the human brain. The research area of machine learning and cognitive computing cover many fields like psychology, biology, signal processing, physics, information theory, mathematics, and statistics that can be used effectively for topology management. Therefore, the utilization of machine learning techniques like data analytics and cognitive power will lead to better performance of communication and wireless systems.

Smart Antennas and Electromagnetic Signal Processing in Advanced Wireless Technology - Paul R.P. Hoole 2022-09-01 The book addresses the current demand for a scientific approach to advanced wireless technology and its future developments. It gives a clear presentation of both antennas and adaptive signal processing which is what makes antennas powerful, maneuverable and necessary for advanced wireless technology. The book presents electromagnetic

signal processing techniques that both control the antenna beam and track the moving station, which is required for effective, fast, dynamic beamforming. The first part of the book presents a comprehensive description and analysis of basic antenna theory, starting from short dipole antennas to array antennas. This section also includes important concepts related to antenna parameters, electromagnetic wave propagation, the Friis equation, the radar equation and wave reflection and transmission through media. The second part of the book focuses on smart antennas, commencing from a look at the traditional approach to beamforming before getting into the details of smart antennas. Complete derivation and description of the techniques for electromagnetic field signal processing techniques for adaptive beamforming are also presented. Artificial Intelligence (AI) driven beamforming is presented using computationally fast and low-memory demanding technique for AI beamforming is presented with the different excitation functions available. A novel method for fast, low memory and accurate, maneuverable single beam generation is presented, as well as other methods for beamforming with fewer elements along with a simple method for tracking the mobile antenna and station. In this section, for completeness, the use of antenna signal processing for synthetic aperture techniques for imaging is also presented, specifically the Inverse Synthetic Aperture Imaging technique. The third part of the book presents technological aspects of advanced wireless technology, including the 5G wireless system and the various devices needed to construct it. While the books' main emphasis is theoretical understanding and design, it includes applications, and legal matters are also presented.

5G NR: The Next Generation Wireless Access Technology - Erik Dahlman 2018-08-09

5G NR: The Next Generation Wireless Access Technology follows the authors' highly celebrated books on 3G and 4G by providing a new level of insight into 5G NR. After an initial discussion of the background to 5G, including requirements, spectrum aspects and the standardization timeline, all technology features of the first phase of NR are described in detail. Included is a detailed description of the NR physical-layer structure and higher-layer protocols, RF and spectrum aspects and co-existence and interworking with LTE. The book provides a good understanding of NR and the different NR technology components, giving insight into why a certain solution was selected. Content includes: Key radio-related requirements of NR, design principles, technical features Details of basic NR transmission structure, showing where it has been inherited from LTE and where it deviates from it, and the reasons why NR Multi-antenna transmission functionality Detailed description of the signals and functionality of the initial NR access, including signals for synchronization and system information, random access and paging LTE/NR co-existence in the same spectrum, the benefits of their interworking as one system The different aspects of mobility in NR RF requirements for NR will be described both for BS and UE, both for the legacy bands and for the new mm-wave bands Gives a concise and accessible explanation of the underlying technology and standards for 5G NR radio-access technology Provides detailed description of the NR physical-layer structure and higher-layer protocols, RF and spectrum aspects and co-existence and interworking with LTE Gives insight not only into the details of the NR specification but also an understanding of why certain solutions look like they do Enabling 5G Communication Systems to Support Vertical Industries - Muhammad Ali Imran 2019-06-19

How 5G technology can support the demands of multiple vertical industries Recent advances in technologyhave created new vertical industries that are highly dependent on the availability and reliability of data between multiple locations. The 5G system, unlike previous generations, will be entirely data driven—addressing latency, resilience, connection density, coverage area, and other vertical industry criteria. Enabling 5G Communication Systems to Support Vertical Industries demonstrates how 5G communication systems can meet the needs unique to vertical industries for efficient, cost-effective delivery of service. Covering both theory and practice, this book explores solutions to problems in specific industrial sectors including smart transportation, smart agriculture, smart grid, environmental monitoring, and disaster management. The 5G communication system will have to provide customized solutions to accommodate each vertical industry's specific requirements. Whether an industry practitioner designingthe next generation of wireless communications or a researcher needing to identify open issues and classify their research, this timely book: Covers the much-discussed topics of supporting multiple vertical industries and new ICT challenges Addresses emerging issues and real-world problems surrounding 5G technology in wireless communication and networking Explores a comprehensive array of essential topics such as connected health, smart transport, smart manufacturing, and more Presents important topics in a clear, concise style suitable for new learners and professionals alike Includes contributions from experts and industry leaders, system diagrams, charts, tables, and examples Enabling 5G Communication Systems to Support Vertical Industries is a valuable resource telecom engineers industry professionals, researchers, professors,

doctorate, and postgraduate students requiring up-to-date information on supporting vertical industries with 5G technology systems.

Advanced Wireless Sensing Techniques for 5G Networks - Ashish Bagwari 2018-09-21 This book written for students of electronics and communication, students of computer science and communications engineers addresses topics such as Introduction of CRN, Advanced spectrum sensing techniques, Cooperative sensing techniques, Distributed sensing techniques, Issues in advanced sensing techniques, and Applications of 5G Networks. It provides new algorithms, explores recent results, and evaluates the performance of technologies in use in this area. It also provides new research topics and sensing techniques related to 5G networks for researchers.

Towards 5G Wireless Networks - Hossein Khaleghi Bizaki 2016-12-14 This book intends to provide highlights of the current research topics in the field of 5G and to offer a snapshot of the recent advances and major issues faced today by the researchers in the 5G physical layer perspective. Various aspects of 5G system is deeply discussed (in three parts and ten chapters) with emphasis on its physical layer. Each chapter provides a comprehensive survey of the subject area and ends with a rich list of references to provide an in-depth coverage of the application at hand.

Cognitive Radio Technology - Bruce A. Fette 2009-04-28 This book gives a thorough knowledge of cognitive radio concepts, principles, standards, spectrum policy issues and product implementation details. In addition to 16 chapters covering all the basics of cognitive radio, this new edition has eight brand-new chapters covering cognitive radio in multiple antenna systems, policy language and policy engine, spectrum sensing, rendezvous techniques, spectrum consumption models, protocols

for adaptation, cognitive networking, and information on the latest standards, making it an indispensable resource for the RF and wireless engineer. The new edition of this cutting edge reference, which gives a thorough knowledge of principles, implementation details, standards, policy issues in one volume, enables the RF and wireless engineer to master and apply today's cognitive radio technologies. Bruce Fette, PhD, is Chief Scientist in the Communications Networking Division of General Dynamics C4 Systems in Scottsdale, AZ. He worked with the Software Defined Radio (SDR) Forum from its inception, currently performing the role of Technical Chair, and is a panelist for the IEEE Conference on Acoustics Speech and Signal Processing Industrial Technology Track. He currently heads the General Dynamics Signal Processing Center of Excellence in the Communication Networks Division. Dr. Fette has 36 patents and has been awarded the "Distinguished Innovator Award". * Foreword and a chapter contribution by Joe Mitola, the creator of the field * Discussion of cognitive aids to the user, spectrum owner, network operator * Explanation of capabilities such as time – position awareness, speech and language awareness, multi-objective radio and network optimization, and supporting database infrastructure * Detailed information on product implementation to aid product developers * Thorough descriptions of each cognitive radio component technology provided by leaders of their respective fields, and the latest in high performance analysis – implementation techniques * Explanations of the complex architecture and terminology of the current standards activities * Discussions of market opportunities created by cognitive radio technology *Physical Layer Security* - Khoa N. Le 2021-01-24 This book studies the vulnerability of wireless communications under line-of-sight (LoS) and non-LoS

correlated fading environments. The authors theoretically and practically provide physical layer security analyses for several technologies and networks such as Fifth-Generation (5G) networks, Internet of Things (IoT) applications, and Non-orthogonal multiple access (NOMA). The authors have provided these under various practical scenarios, and developed theoretical aspects to validate their proposed applications. Presents physical layer security (PLS) under correlated fading environments, 5G wireless networks, and NOMA networks; Provides end-to-end analyses, combination of channel correlation and outdated CSI and their effects on PL; Includes contributions of PLS research written by global experts in academia and industry.

Emerging Wireless Communication and Network Technologies - Karm Veer Arya 2018-06-09 The book covers a wide range of wireless communication and network technologies, and will help readers understand the role of wireless technologies in applications touching on various spheres of human life, e.g. healthcare, agriculture, building smart cities, forecasting and the manufacturing industry. The book begins by discussing advances in wireless communication, including emerging trends and research directions for network technologies. It also highlights the importance of and need to actively develop these technologies. In turn, the book addresses different algorithms and methodologies which could be beneficial in implementing 5G Mobile Communication, Vehicular Ad-hoc Networks (VANET), Reliable Cooperative Networks, Delay Tolerant Networks (DTN) and many more contexts related to advanced communications. It then addresses the prominence of wireless communication in connection with the Internet of Things (IoT), Mobile Opportunistic Networks and Cognitive Radio Networks

(CRN). Lastly, it presents the new horizons in architecture and building protocols for Li-Fi (Light-Fidelity) and Wearable Sensor Technology.

5G Mobile Communications - Saad Asif 2018-07-20 This book will help readers comprehend technical and policy elements of telecommunication particularly in the context of 5G. It first presents an overview of the current research and standardization practices and lays down the global frequency spectrum allocation process. It further lists solutions to accommodate 5G spectrum requirements. The readers will find a considerable amount of information on 4G (LTE-Advanced), LTE-Advance Pro, 5G NR (New Radio); transport network technologies, 5G NGC (Next Generation Core), OSS (Operations Support Systems), network deployment and end-to-end 5G network architecture. Some details on multiple network elements (end products) such as 5G base station/small cells and the role of semiconductors in telecommunication are also provided. Keeping trends in mind, service delivery mechanisms along with state-of-the-art services such as MFS (mobile financial services), mHealth (mobile health) and IoT (Internet-of-Things) are covered at length. At the end, telecom sector's burning challenges and best practices are explained which may be looked into for today's and tomorrow's networks. The book concludes with certain high level suggestions for the growth of telecommunication, particularly on the importance of basic research, departure from ten-year evolution cycle and having a 20–30 year plan. Explains the conceivable six phases of mobile telecommunication's ecosystem that includes R&D, standardization, product/network/device & application development, and burning challenges and best practices Provides an overview of research and standardization on 5G Discusses solutions to address 5G spectrum requirements while describing

the global frequency spectrum allocation process Presents various case studies and policies Provides details on multiple network elements and the role of semiconductors in telecommunication Presents service delivery mechanisms with special focus on IoT

From GSM to LTE-Advanced Pro and 5G - Martin Sauter 2017-10-23
A comparative introduction to major global wireless standards, technologies and their applications From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband, 3rd Edition provides technical descriptions of the various wireless technologies currently in use. It explains the rationales behind their differing mechanisms and implementations while exploring the advantages and limitations of each technology. This edition has been fully updated and substantially expanded to reflect the significant evolution in mobile network technology occurring over the past several years. The chapter on LTE has been extensively enhanced with new coverage of current implementations of LTE carrier aggregation, mobility management, cell reselection and handover procedures, as well as the latest developments in 5G radio and core networks in 3GPP. It now features additional information on the TD-LTE air interface, IPv6 in mobile networks, Network Function Virtualization (NFV) and Narrowband Internet of Things (NB-IOT). Voice-over-LTE (VoLTE) is now treated extensively in a separate chapter featuring coverage of the VoLTE call establishment process, dedicated bearer setup, header compression, speech codec and bandwidth negotiation, supplementary service configuration and VoLTE emergency calls. In addition, extensive coverage of Voice-over-Wifi and mission critical communication for public safety organizations over LTE has been added. The WLAN chapter now provides coverage of WPA2-Professional

with certificates for authentication in large deployments, such as the global Eduroam network and the new WLAN 60 GHz air interface. Bluetooth evolution has been addressed by including a detailed description of Bluetooth Low Energy (BLE) in the chapter devoted to Bluetooth. Describes the different systems based on the standards, their practical implementation and design assumptions, and the performance and capacity of each system in practice is analyzed and explained Questions at the end of each chapter and answers on the accompanying website make this book ideal for self-study or as course material.

Fundamental and Supportive Technologies for 5G Mobile Networks - El-Kader, Sherine Mohamed Abd 2019-11-29 Mobile wireless communication systems have affected every aspect of life. By providing seamless connectivity, these systems enable almost all the smart devices in the world to communicate with high speed throughput and extremely low latency. The next generation of cellular mobile communications, 5G, aims to support the tremendous growth of interconnected things/devices (i.e., internet of things [IoT]) using the current technologies and extending them to be used in higher frequencies to cope with the huge number of different devices. In addition, 5G will provide massive capacity, high throughput, lower end-to-end delay, green communication, cost reduction, and extended coverage area. Fundamental and Supportive Technologies for 5G Mobile Networks provides detailed research on technologies used in 5G, their benefits, practical designs, and recent challenges and focuses on future applications that could exploit 5G network benefits. The content within this publication examines cellular communication, data transmission, and high-speed communication. It is designed for network analysts, IT specialists, industry professionals, software

engineers, researchers, academicians, students, and scientists.

5G Mobile Communications - Wei Xiang 2016-10-13 This book provides a comprehensive overview of the emerging technologies for next-generation 5G mobile communications, with insights into the long-term future of 5G. Written by international leading experts on the subject, this contributed volume covers a wide range of technologies, research results, and networking methods. Key enabling technologies for 5G systems include, but are not limited to, millimeter-wave communications, massive MIMO technology and non-orthogonal multiple access. 5G will herald an even greater rise in the prominence of mobile access based upon both human-centric and machine-centric networks. Compared with existing 4G communications systems, unprecedented numbers of smart and heterogeneous wireless devices will be accessing future 5G mobile systems. As a result, a new paradigm shift is required to deal with challenges on explosively growing requirements in mobile data traffic volume (1000x), number of connected devices (10–100x), typical end-user data rate (10–100x), and device/network lifetime (10x). Achieving these ambitious goals calls for revolutionary candidate technologies in future 5G mobile systems. Designed for researchers and professionals involved with networks and communication systems, 5G Mobile Communications is a straightforward, easy-to-read analysis of the possibilities of 5G systems.

Space Information Networks - Quan Yu 2019-01-23 This book constitutes the proceedings of the Third International Conference on Space Information Networks, SINC 2018, held in Changchun, China, in August 2018. The 17 full and 7 short papers presented in this volume were carefully reviewed and selected from 140 submissions. The

papers are organized in topical sections on architecture and efficient networking mechanism; theories and methods of high speed transmission; and sparse characterization and fusion processing.

Fundamentals of 5G Mobile Networks - Jonathan Rodriguez 2015-06-22 Fundamentals of 5G Mobile Networks provides an overview of the key features of the 5th Generation (5G) mobile networks, discussing the motivation for 5G and the main challenges in developing this new technology. This book provides an insight into the key areas of research that will define this new system technology paving the path towards future research and development. The book is multi-disciplinary in nature, and aims to cover a whole host of intertwined subjects that will predominantly influence the 5G landscape, including the future Internet, cloud computing, small cells and self-organizing networks (SONs), cooperative communications, dynamic spectrum management and cognitive radio, Broadcast-Broadband convergence , 5G security challenge, and green RF. This book aims to be the first of its kind towards painting a holistic perspective on 5G Mobile, allowing 5G stakeholders to capture key technology trends on different layering domains and to identify potential inter-disciplinary design aspects that need to be solved in order to deliver a 5G Mobile system that operates seamlessly.

Implementing Data Analytics and Architectures for Next Generation Wireless Communications - Bhatt, Chintan 2021-08-13 Wireless communication is continuously evolving to improve and be a part of our daily communication. This leads to improved quality of services and applications supported by networking technologies. We are now able to use LTE, LTE-Advanced, and other emerging technologies due to the enormous efforts that are made to improve the quality of service in cellular

networks. As the future of networking is uncertain, the use of deep learning and big data analytics is a point of focus as it can work in many capacities at a variety of levels for wireless communications. Implementing Data Analytics and Architectures for Next Generation Wireless Communications addresses the existing and emerging theoretical and practical challenges in the design, development, and implementation of big data algorithms, protocols, architectures, and applications for next generation wireless communications and their applications in smart cities. The chapters of this book bring together academics and industrial practitioners to exchange, discuss, and implement the latest innovations and applications of data analytics in advanced networks. Specific topics covered include key encryption techniques, smart home appliances, fog communication networks, and security in the internet of things. This book is valuable for technologists, data analysts, networking experts, practitioners, researchers, academicians, and students.

Multiple Access Techniques for 5G Wireless Networks and Beyond - Mojtaba Vaezi 2018-08-23
This book presents comprehensive coverage of current and emerging multiple access, random access, and waveform design techniques for 5G wireless networks and beyond. A definitive reference for researchers in these fields, the book describes recent research from academia, industry, and standardization bodies. The book is an all-encompassing treatment of these areas addressing orthogonal multiple access and waveform design, non-orthogonal multiple access (NOMA) via power, code, and other domains, and orthogonal, non-orthogonal, and grant-free random access. The book builds its foundations on state of the art research papers, measurements, and experimental results from a variety of sources.

Fog Computing - Assad Abbas
2020-04-21
Summarizes the current state
and upcoming trends within
the area of fog computing
Written by some of the leading
experts in the field, Fog
Computing: Theory and
Practice focuses on the
technological aspects of
employing fog computing in
various application domains,
such as smart healthcare,
industrial process control and
improvement, smart cities, and
virtual learning environments.
In addition, the Machine-to-
Machine (M2M)
communication methods for fog
computing environments are
covered in depth. Presented in
two parts—Fog Computing
Systems and Architectures, and
Fog Computing Techniques
and Application—this book
covers such important topics as
energy efficiency and Quality
of Service (QoS) issues,
reliability and fault tolerance,
load balancing, and scheduling
in fog computing systems. It
also devotes special attention
to emerging trends and the
industry needs associated with
utilizing the mobile edge
computing, Internet of Things
(IoT), resource and pricing
estimation, and virtualization
in the fog environments.
Includes chapters on deep
learning, mobile edge
computing, smart grid, and
intelligent transportation
systems beyond the theoretical
and foundational concepts
Explores real-time traffic
surveillance from video
streams and interoperability of
fog computing architectures
Presents the latest research on
data quality in the IoT, privacy,
security, and trust issues in fog
computing Fog Computing:
Theory and Practice provides a
platform for researchers,
practitioners, and graduate
students from computer
science, computer engineering,
and various other disciplines to
gain a deep understanding of
fog computing.
*International Conference on
Applications and Techniques in
Cyber Intelligence ATCI 2019* -
Jemal H. Abawajy 2019-07-31
This book presents innovative
ideas, cutting-edge findings,
and novel techniques, methods,

and applications in a broad range of cybersecurity and cyberthreat intelligence areas. As our society becomes smarter, there is a corresponding need to be able to secure our cyberfuture. The approaches and findings described in this book are of interest to businesses and governments seeking to secure our data and underpin infrastructures, as well as to individual users.

Cloud Based 5G Wireless Networks - Yin Zhang 2016-11-09
This SpringerBrief introduces key techniques for 5G wireless networks. The authors cover the development of wireless networks that led to 5G, and how 5G mobile communication technology (5G) can no longer be defined by a single business model or a typical technical characteristic. The discussed networks functions and services include Network Foundation Virtualization (N-FV), Cloud Radio Access Networks (Cloud-RAN), and Mobile Cloud Networking (MCN). The benefits of cloud platforms are examined, as are definable networking and green wireless networking. Other related and representative projects on 5G are mobile and wireless communications enablers for the Twenty-Twenty Information Society, Multi-hop Cellular Networks, Network Function as-a-Service over Virtualized Infrastructures, iJOIN, and Nuage Virtualized Services Platform. Major applications of 5G range from RAN sharing and Multi-Operator Core Networks to mobile convergence. Enhancing the user experience by providing smart and customized services, 5G will support the explosive growth of big data, mobile internet, digital media, and system efficiency. This SpringerBrief is designed for professionals, researchers, and academics working in networks or system applications. Advanced-level students of computer science or computer engineering will also find the content valuable.

From Smart Grid to Internet of Energy - Ersan Kabalci

2019-07-30
From Smart Grid to Internet of Energy covers novel and emerging metering and monitoring technologies, communication systems, and technologies in smart grid areas to present a valuable reference for readers from various engineering backgrounds. Considering relevant topics on the essentials of smart grids and emerging wireless communication systems, such as IEEE 802.15.4 based novel technologies, cognitive radio networks and Internet of Energy, this book offers a discussion on the emerging trends and research direction for communication technologies. The book includes research concepts and visualization of smart grids and related communication technologies, making it a useful book for practicing network engineers. Includes global case studies and examples of communications systems integrated with smart grids Presents literature surveys for a wide variety of smart grids, wired and wireless communication technologies, big data, privacy and security Covers all aspects of IoE systems and discusses the differences between IoE and Smart Grids

5G Mobile Communications - Saad Asif 2018-07-20 This book will help readers comprehend technical and policy elements of telecommunication particularly in the context of 5G. It first presents an overview of the current research and standardization practices and lays down the global frequency spectrum allocation process. It further lists solutions to accommodate 5G spectrum requirements. The readers will find a considerable amount of information on 4G (LTE-Advanced), LTE-Advance Pro, 5G NR (New Radio); transport network technologies, 5G NGC (Next Generation Core), OSS (Operations Support Systems), network deployment and end-to-end 5G network architecture. Some details on multiple network elements (end products) such as 5G base

station/small cells and the role of semiconductors in telecommunication are also provided. Keeping trends in mind, service delivery mechanisms along with state-of-the-art services such as MFS (mobile financial services), mHealth (mobile health) and IoT (Internet-of-Things) are covered at length. At the end, telecom sector's burning challenges and best practices are explained which may be looked into for today's and tomorrow's networks. The book concludes with certain high level suggestions for the growth of telecommunication, particularly on the importance of basic research, departure from ten-year evolution cycle and having a 20–30 year plan. Explains the conceivable six phases of mobile telecommunication's ecosystem that includes R&D, standardization, product/network/device & application development, and burning challenges and best practices Provides an overview of research and standardization on 5G Discusses solutions to address 5G spectrum requirements while describing the global frequency spectrum allocation process Presents various case studies and policies Provides details on multiple network elements and the role of semiconductors in telecommunication Presents service delivery mechanisms with special focus on IoT

Intelligent and Fuzzy Techniques in Aviation 4.0 - Cengiz Kahraman 2021-08-26 This book offers a comprehensive reference guide for the theory and practice of intelligent and fuzzy techniques in Aviation 4.0. It provides readers with the necessary intelligent and fuzzy tools for Aviation 4.0 when incomplete, vague, and imprecise information or insufficient data exist in hand, where classical modeling approaches cannot be applied. The respective chapters, written by prominent researchers, explain a wealth of both basic and advanced concepts including baggage services, catering services, check-in and boarding services,

maintenance and cargo management, security, etc. To foster reader comprehension, all chapters include relevant numerical examples or case studies. Taken together, they form an excellent reference guide for researchers, lecturers, and postgraduate students pursuing research on Aviation 4.0. Moreover, by extending all the main aspects of Aviation 4.0 to its intelligent and fuzzy counterparts, the book presents a dynamic snapshot of the field that is expected to stimulate new directions, ideas, and developments.

5G Mobile and Wireless Communications Technology - Afif Osseiran 2016-06-02
A comprehensive overview of the 5G landscape covering technology options, most likely use cases and potential system architectures.

5G and Beyond Wireless Systems - Manish Mandloi 2020-08-11
This book presents the fundamental concepts, recent advancements, and opportunities for future research in various key enabling technologies in next-generation wireless communications. The book serves as a comprehensive source of information in all areas of wireless communications with a particular emphasis on physical (PHY) layer techniques related to 5G wireless systems and beyond. In particular, this book focuses on different emerging techniques that can be adopted in 5G wireless networks. Some of those techniques include massive-MIMO, mm-Wave communications, spectrum sharing, device-to-device (D2D) and vehicular to anything (V2X) communications, radio-frequency (RF) based energy harvesting, and NOMA. Subsequent chapters cover the fundamentals and PHY layer design aspects of different techniques that can be useful for the readers to get familiar with the emerging technologies and their applications.

UAV Communications for 5G and Beyond - Yong Zeng 2020-12-14

Explore foundational and advanced issues in UAV cellular communications with this cutting-edge and timely new resource UAV Communications for 5G and Beyond delivers a comprehensive overview of the potential applications, networking architectures, research findings, enabling technologies, experimental measurement results, and industry standardizations for UAV communications in cellular systems. The book covers both existing LTE infrastructure, as well as future 5G-and-beyond systems. UAV Communications covers a range of topics that will be of interest to students and professionals alike. Issues of UAV detection and identification are discussed, as is the positioning of autonomous aerial vehicles. More fundamental subjects, like the necessary tradeoffs involved in UAV communication are examined in detail. The distinguished editors offer readers an opportunity to improve their ability to plan and design for the near-future, explosive growth in the number of UAVs, as well as the correspondingly demanding systems that come with them. Readers will learn about a wide variety of timely and practical UAV topics, like: Performance measurement for aerial vehicles over cellular networks, particularly with respect to existing LTE performance Inter-cell interference coordination with drones Massive multiple-input and multiple-output (MIMO) for Cellular UAV communications, including beamforming, null-steering, and the performance of forward-link C&C channels 3GPP standardization for cellular-supported UAVs, including UAV traffic requirements, channel modeling, and interference challenges Trajectory optimization for UAV communications Perfect for professional engineers and researchers working in the field of unmanned aerial vehicles, UAV Communications for 5G and Beyond also belongs

on the bookshelves of students in masters and PhD programs studying the integration of UAVs into cellular communication systems.

5G Mobile Networks - Larry Peterson 2020-07-22
This book describes the 5G mobile network from a systems perspective, focusing on the fundamental design principles that are easily obscured by an overwhelming number of acronyms and standards definitions that dominate this space. The book is written for system generalists with the goal of helping bring up to speed a community that understands a broad range of systems issues (but knows little or nothing about the cellular network) so it can play a role in the network's evolution. This is a community that understands both feature velocity and best practices in building robust scalable systems, and so it has an important role to play in bringing to fruition all of 5G's potential. In addition to giving a step-by-step tour of the design rationale behind 5G, the book aggressively disaggregates the 5G mobile network. Building a disaggregated, virtualized, and software-defined 5G access network is the direction the industry is already headed (for good technical and business reasons), but breaking the 5G network down into its elemental components is also the best way to explain how 5G works. It also helps to illustrate how 5G might evolve in the future to provide even more value. An open source implementation of 5G serves as the technical underpinning for the book. The authors, in collaboration with industrial and academic partners, are working towards a cloud-based implementation that takes advantage of both Software-Defined Networking (SDN) and cloud-native (microservice-based) architectures, culminating in a managed 5G-enabled EdgeCloud-as-a-Service built on the components and mechanisms described throughout the book.
Enabling Technologies and Architectures for Next-Generation Networking

Capabilities - Elkhodr, Mahmoud 2018-10-19 With the rise of mobile and wireless technologies, more sustainable networks are necessary to support communication. These next-generation networks can now be utilized to extend the growing era of the Internet of Things. Enabling Technologies and Architectures for Next-Generation Networking Capabilities is an essential reference source that explores the latest research and trends in large-scale 5G technologies deployment, software-defined networking, and other emerging network technologies. Featuring research on topics such as data management, heterogeneous networks, and spectrum sensing, this book is ideally designed for computer engineers, technology developers, network administrators and researchers, professionals, and graduate-level students seeking coverage on current and future network technologies.

Wideband, Multiband, and Smart Antenna Systems - Mohammad Abdul Matin 2021-09-21 This book provides current R&D trends and novel approaches in design and analysis of broadband, multiband, and smart antennas for 5G and B5G mobile and wireless applications, as well as the identification of integration techniques of these antennas in a diverse range of devices. The book presents theoretical and experimental approaches to help the reader in understanding the unique design issues and more advanced research. Moreover, the book includes chapters on the fundamentals of antenna theory. The book is pertinent to professionals and researchers working in the field of antenna engineering; it is written for graduate students, researchers, academics, and industry practitioners who want to improve their understanding in the current research trends in design analysis of broadband, multiband, and smart antennas

for wireless applications.
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

4G: LTE/LTE-Advanced for Mobile Broadband - Erik
Dahlman 2013-10-07
This book focuses on LTE with
full updates including LTE-
Advanced (Release-11) to
provide a complete picture of
the LTE system. Detailed
explanations are given for the
latest LTE standards for radio
interface architecture, the
physical layer, access
procedures, broadcast,
relaying, spectrum and RF
characteristics, and system
performance. Key technologies
presented include multi-carrier
transmission, advanced single-
carrier transmission, advanced
receivers, OFDM, MIMO and
adaptive antenna solutions,
radio resource management
and protocols, and different
radio network architectures.
Their role and use in the
context of mobile broadband
access in general is explained,
giving both a high-level
overview and more detailed
step-by-step explanations. This
book is a must-have resource

for engineers and other professionals in the telecommunications industry, working with cellular or wireless broadband technologies, giving an understanding of how to utilize the new technology in order to stay ahead of the competition. New to this edition: In-depth description of CoMP and enhanced multi-antenna transmission including new reference-signal structures and feedback mechanisms Detailed description of the support for heterogeneous deployments provided by the latest 3GPP release Detailed description of new enhanced downlink control-channel structure (EPDDCH) New RF configurations including operation in non-contiguous spectrum, multi-bands base stations and new frequency bands Overview of 5G as a set of well-integrated radio-access technologies, including support for higher frequency bands and flexible spectrum management, massive antenna configurations, and ultra-dense deployments Covers a complete update to the latest 3GPP Release-11 Two new chapters on HetNet, covering small cells/heterogeneous deployments, and CoMP, including Inter-site coordination Overview of current status of LTE release 12 including further enhancements of local-area, CoMP and multi-antenna transmission, Machine-type-communication, Device-to-device communication
Key Technologies for 5G Wireless Systems - Vincent W. S. Wong 2017-03-02 Get up to speed with the protocols, network architectures and techniques for 5G wireless networks with this comprehensive guide.
5G: 2020 and Beyond - Ramjee Prasad 2014-09-01 The future society would be ushered in a new communication era with the emergence of 5G. 5G would be significantly different, especially, in terms of architecture and operation in comparison with the previous communication generations (4G, 3G...). This book discusses

the various aspects of the architecture, operation, possible challenges, and mechanisms to overcome them. Further, it supports users' interac- tion through communication devices relying on Human Bond Communication and COmmunication-NAvigation-SENsing- SErvices (CONASENSE). Topics broadly covered in this book are; • Wireless Innovative System for Dynamically Operating Mega Communications (WISDOM) • Millimeter Waves and Spectrum Management • Cyber Security • Device to Device Communication Content: Introduction WISDOM Concept and Challenges SMNAT and Enabler of Device-to-Device Communication Dynamic Spectrum Management and mm-WAVES Cyber Security and Threats Beyond 2020

The Technology, Business, and Economics of Streaming Video - Eli Noam 2021-01-29 Along with its interrelated companion volume, The Content, Impact, and Regulation of Streaming Video, this book covers the next generation of TV—streaming online video, with details about its present and a broad perspective on the future. It reviews the new technical elements that are emerging, both in hardware and software, their long-term trend, and the implications. It discusses the emerging 'media cloud' of video and infrastructure platforms, and the organizational form of such TV.

Moving Broadband Mobile Communications Forward - Abdelfatteh Haidine 2021-08-18 The deployment of 4G/LTE (Long-Term Evolution) mobile networks has solved the major challenge of high capacities to build a real broadband mobile internet. This was possible mainly through a very strong physical layer and flexible network architecture. However, bandwidth-hungry services such as virtual reality (VR) and augmented reality (AR), have been developed in an unprecedented way. Furthermore, mobile networks

are facing other new services with extreme demand for greater reliability and almost zero-latency performance, like vehicle communications and the Internet of Vehicles (IoV). Therefore, industries and researchers are investigating new physical layers and softwarization techniques and including more intelligence in 5G and beyond 5G (B5G/6G). This book discusses some of these softwarization techniques, such as fog computing, cloud computing, and artificial intelligence (AI) and machine learning (ML). It also presents use cases showing practical aspects from 5G deployment scenarios, where other communications technologies will co-habit to build the landscape of next-generation mobile networks (NGMNs).

5G System Design - Patrick Marsch 2018-06-11 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). 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.
Cognitive Radio in 4G/5G Wireless Communication Systems - Shahriar Shirvani Moghaddam 2018-12-05
The limitation of the radio spectrum and the rapid growth of communication applications make optimal usage of radio resources essential. Cognitive radio (CR) is an attractive research area for 4G/5G wireless communication systems, which enables unlicensed users to access the spectrum. Delivering higher spectral efficiency, supporting the higher number of users, and achieving higher coverage and throughput are the main advantages of CR-based networks compared to conventional ones. The main goal of this book is to provide highlights of current research topics in the field of CR-based systems. The book consists of six chapters in three sections focusing on primary and secondary users, spectrum sensing, spectrum sharing, CR-based IoT, emulation attack, and interference alignment.