LTE

Yifei Yuan

4G: LTE/LTE-Advanced for Mobile Broadband Erik Dahlman, Stefan Parkvall, Johan Skold, 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, multibands 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

An Introduction to LTE Christopher Cox, 2014-05-12 Following on from the successful first edition (March 2012), this book gives a clear explanation of what LTE does and how it works. The content is expressed at a systems level, offering readers the opportunity to grasp the key factors that make LTE the hot topic amongst vendors and operators across the globe. The book assumes no more than a basic knowledge of mobile telecommunication systems, and the reader is not expected to have any previous knowledge of the complex mathematical operations that underpin LTE. This second edition introduces new material for the current state of the industry, such as the new features of LTE in Releases 11 and 12, notably coordinated multipoint transmission and proximity services; the main short- and long-term solutions for LTE voice calls, namely circuit switched fallback and the IP multimedia subsystem; and the evolution and current state of the LTE market. It also extends some of the material from the first edition, such as inter-operation with other technologies such as GSM, UMTS, wireless local area networks and cdma2000; additional features of LTE Advanced, notably heterogeneous networks and traffic offloading; data transport in the evolved packet core; coverage and capacity estimation for LTE; and a more rigorous treatment of modulation, demodulation and OFDMA. The author breaks down the system into logical blocks, by initially introducing the architecture of LTE, explaining the techniques used for radio transmission and reception and the overall operation of the system, and

concluding with more specialized topics such as LTE voice calls and the later releases of the specifications. This methodical approach enables readers to move on to tackle the specifications and the more advanced texts with confidence.

From GSM to LTE-Advanced Pro and 5G Martin Sauter, 2021-01-19 A revised edition of the text that offers a comparative introduction to global wireless standards, technologies, and their applications The revised and updated fourth edition of From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband offers an authoritative guide to the technical descriptions of the various wireless technologies currently in use. The author—a noted expert on the topic—explains the rationale behind their differing mechanisms and implementations while exploring the advantages and limitations of each technology. The fourth edition reflects the significant changes in mobile network technology that have taken place since the third edition was published. The text offers a new chapter on 5G NR that explores its nonstandalone and standalone architecture. In the Wi-Fi chapter, additional sections focus on the new WPA3 authentication protocol, the new 802.11ax air interface and protocol extensions like 802.11k and 11v for meshed networks. This important book: Presents the various systems based on the standards, their practical implementation and design assumptions, and their performance and capacity Provides an in-depth analysis of each system in practice Offers an updated edition of the most current changes to mobile network technology Includes questions at the end of each chapter and answers on the accompanying website that make this book ideal for self-study or as course material Written for students and professionals of wireless technologies, the revised fourth

edition of From GSM to LTE-Advanced Pro and 5G provides an in-depth review and description of the most current mobile networks and broadband.

Fundamentals of LTE Arunabha Ghosh, Jun Zhang, Jeffrey G. Andrews, Rias Muhamed, 2010-09-09 The Definitive Guide to LTE Technology Long-Term Evolution (LTE) is the next step in the GSM evolutionary path beyond 3G technology, and it is strongly positioned to be the dominant global standard for 4G cellular networks. LTE also represents the first generation of cellular networks to be based on a flat IP architecture and is designed to seamlessly support a variety of different services, such as broadband data, voice, and multicast video. Its design incorporates many of the key innovations of digital communication, such as MIMO (multiple input multiple output) and OFDMA (orthogonal frequency division multiple access), that mandate new skills to plan, build, and deploy an LTE network. In Fundamentals of LTE, four leading experts from academia and industry explain the technical foundations of LTE in a tutorial style—providing a comprehensive overview of the standards. Following the same approach that made their recent Fundamentals of WiMAX successful, the authors offer a complete framework for understanding and evaluating LTE. Topics include Cellular wireless history and evolution: Technical advances, market drivers, and foundational networking and communications technologies Multicarrier modulation theory and practice: OFDM system design, peak-to-average power ratios, and SC-FDE solutions Frequency Domain Multiple Access: OFDMA downlinks, SC-FDMA uplinks, resource allocation, and LTE-specific implementation Multiple antenna techniques and tradeoffs: spatial diversity, interference cancellation, spatial multiplexing, and multiuser/networked MIMO LTE standard overview: air interface protocol, channel structure, and

physical layers Downlink and uplink transport channel processing: channel encoding, modulation mapping, Hybrid ARQ, multi-antenna processing, and more Physical/MAC layer procedures and scheduling: channel-aware scheduling, closed/open-loop multi-antenna processing, and more Packet flow, radio resource, and mobility management: RLC, PDCP, RRM, and LTE radio access network mobility/handoff procedures

Understanding LTE and its Performance Tara Ali-Yahiya,2011-07-12 The aim of this book is to provide comprehensive coverage of current state of the art theoretical and technological aspects of broadband mobile and wireless networks focusing on Long Term Evolution Network. The presentation starts from basic principles, and proceeds to the most advanced topics. Provided schemes are developed and oriented in the context of actual closed standards of the IEEE working groups and the 3 GPPP LTE. Also this book will focus on the understanding of the LTE technology as well as the study of its performance in terms of mobility, quality of service, security, resource allocation.

3G Evolution Erik Dahlman,Stefan Parkvall,Johan Skold,Per Beming,2010-07-28 Reflecting the recent completion of LTE's specification, the new edition of this bestseller has been fully updated to provide a complete picture of the LTE system. The latest LTE standards are included on the radio interface architecture, the physical layer, access procedures, MBMS, together with three brand new chapters on LTE Transmission Procedures, Flexible Bandwidth in LTE and LTE evolution into IMT-Advanced. Key technologies presented include multi-carrier transmission, advanced single-carrier transmission, advanced receivers, OFDM, MIMO and adaptive antenna solutions, advanced 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. Both a high-level overview and more detailed step-by-step explanations of HSPA and LTE implementation are given. An overview of other related systems such as TD SCDMA, CDMA2000, and WiMAX is also provided. The new edition has up-to-date coverage of the recently published LTE Release 8 radio-access standard, giving the reader insight into the ongoing and future process of LTE and LTE-Advanced standardisation. Coverage on LTE in this edition includes (total of 270 pages on LTE): Easy-to-access overview of the LTE protocol layers Complete description of LTE physical layer including reference signals, control signalling, multi-antenna transmission schemes Covers both FDD and TDD, their fundamental difference and their impact on the LTE design Detailed description of access procedures including cell search, random access, broadcast of system information Transmission procedures, including retransmission protocols, scheduling, uplink power control Evolution towards IMT-Advanced (4G) Reading a specification requires some effort. After reading the spec, you would know WHAT to transmit, but not WHY and HOW. This is where our book becomes important. Not only does it provide an easy-to-read description of the signals, procedures, and mechanisms in LTE, it also tells you WHY a certain signal, channel or procedure is present and HOW it is used. After reading the book, you will have a good understanding on how LTE works and why it is designed the way it is. - the authors The authors of the book all work at Ericsson Research and are deeply involved in 3G development and standardisation since the early days of 3G research. They are leading experts in the field and are today still actively contributing to the standardisation of both HSPA and LTE within 3GPP. This includes details of the standards and technologies (160 new pages): LTE radio

interface architecture, LTE physical layer and LTE access procedures. Includes details of the standards and technologies (160 new pages): LTE radio interface architecture, LTE physical layer and LTE access procedures Contains three brand new chapters on LTE: Transmission Procedures, Flexible Bandwidth and LTE Evolution and expanded details on the physical layer (total LTE content is 270 pages) Examines the latest developments in the evolution of LTE into IMT-Advanced, the next stage of 3G Evolution Gives clear explanations of the role of OFDM and MIMO technologies in HSPA and LTE Outlines the System Architecture Evolution (SAE) supporting LTE and HSPA evolution

From GSM to LTE Martin Sauter.2010-12-30 A new edition of Wiley's Communication Systems for the Mobile Information Society, from the same author Wireless systems such as GSM, UMTS, LTE, WiMAX, Wi-Fi and Bluetooth offer possibilities to keep people connected while on the move. In this flood of technology, From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband enables readers to examine and understand each technology, and how to utilise several different systems for the best results. This book contains not only a technical description of the different wireless systems available today, but also explains the rationale behind the different mechanisms and implementations; not only the 'how' but also the 'why' is focused on. Thus the advantages and also limitations of each technology become apparent. Offering a solid introduction to major global wireless standards and comparisons of the different wireless technologies and their applications, this new edition has been updated to provide the latest directions and activities in 3GPP standardization. reaching up to Release 10, and importantly includes a new chapter on LTE. The new LTE chapter covers aspects such

as Mobility Management and Power Optimization, Voice over LTE, and Air Interface and Radio Network. Provides readers with an introduction to major global wireless standards and compares the different wireless technologies and their applications The performance and capacity of each system in practice is analyzed and explained, accompanied with practical tips on how to discover the functionality of different networks Offers approximately 25% new material, which includes a major new chapter on LTE and updates to the existing material including Release 4 BICN in relation to GSM Questions at the end of each chapter and answers on the accompanying website (http://www.wirelessmoves.com) make this book ideal for self study or as course material

Essentials of LTE and LTE-A Amitabha Ghosh, Rapeepat Ratasuk, 2011-08-04 This practical, onestop guide will quickly bring you up to speed on LTE and LTE-Advanced. With everything you need to know about the theory and technology behind the standards, this is a musthave for engineers and managers in the wireless industry. • First book of its kind describing technologies and system performance of LTE-A • Covers the evolution of digital wireless technology, basics of LTE and LTE-A, design of downlink and uplink channels, multi-antenna techniques and heterogeneous networks • Analyzes performance benefits over competing technologies, including WiMAX and 802.16m • Reflects the latest LTE Release-10 standards • Includes numerous examples, including extensive system and link results • Unique approach is accessible to technical and non-technical readers alike

LTE for UMTS Harri Holma, Antti Toskala, 2011-03-16 Written by experts actively involved in the 3GPP standards and product development, LTE for UMTS, Second Edition gives a complete and up-to-date overview of Long Term

Evolution (LTE) in a systematic and clear manner. Building upon on the success of the first edition, LTE for UMTS, Second Edition has been revised to now contain improved coverage of the Release 8 LTE details, including field performance results, transport network, self optimized networks and also covering the enhancements done in 3GPP Release 9. This new edition also provides an outlook to Release 10, including the overview of Release 10 LTE-Advanced technology components which enable reaching data rates beyond 1 Gbps. Key updates for the second edition of LTE for UMTS are focused on the new topics from Release 9 & 10, and include: LTE-Advanced; Self optimized networks (SON); Transport network dimensioning; Measurement results.

An Introduction to LTE Christopher Cox,2012-04-16 An Introduction to LTE explains the technology used by 3GPP Long Term Evolution. The book covers the whole of LTE, both the techniques used for radio communication between the base station and the mobile phone, and the techniques used for signalling communication and data transport in the evolved packet core. It avoids unnecessary detail, focussing instead on conveying a sound understanding of the entire system. The book is aimed at mobile telecommunication professionals, who want to understand what LTE is and how it works. It is invaluable for engineers who are working on LTE, notably those who are transferring from other technologies such as UMTS and cdma2000, those who are experts in one part of LTE but who want to understand the system as a whole, and those who are new to mobile telecommunications altogether. It is also relevant to those working in non technical roles, such as project managers, marketing executives and intellectual property consultants. On completing the book, the reader will have a clear understanding of LTE, and will be able to

tackle the more specialised books and the 3GPP specifications with confidence. Key features - Covers the latest developments in release 10 of the 3GPP specifications, including the new capabilities of LTE-Advanced Includes references to individual sections of the 3GPP specifications, to help readers understand the principles of each topic before going to the specifications for more detailed information Requires no previous knowledge of mobile telecommunications, or of the mathematical techniques that LTE uses for radio transmission and reception

LTE and LTE Advanced André Pérez, 2015-11-04 This book presents the technical characteristics of the two radio network interfaces of mobile 4G, LTE and LTE Advanced. based on Release 8, 9 and 10 of the 3GPP specifications. Points covered include a detailed description of various components of the radio interface. RRC signaling messages used to establish the connection, enabling the security, the paging, the establishment and the release of dedicated and default support and the handover. The PDCP ensures the security of the transmission and allows the recovery during handover and the compression of the headers. The RLC protocol defines the transmission modes with or without acknowledgment. The MAC protocol determines the random access, the data transfer, the timing advance, the scheduling and the discontinuous reception. The physical layer includes a description of the methods of multiplexing (time, frequency and space) and the various signals and physical channels.

The LTE-Advanced Deployment Handbook Jyrki T. J. Penttinen, 2016-01-26 LTE-Advanced is the new Global standard which is expected to create a foundation for the future wireless broadband services. The standard incorporates all the latest technologies recently developed

in the field of wireless communications. Presented in a modular style, the book provides an introductory description for beginners as well as practical guidelines for telecom specialists. It contains an introductory module that is suitable for the initial studies of the technology based on the 3GPPRelease 10, 11 and beyond of LTE and SAE. The latter part of the book is suitable for experienced professionals who will benefit from the practical descriptions of the physical core and radio network planning, end-to-end performance measurements, physical network construction and optimization of the system. The focus of the book is in the functioning, planning, construction, measurements and optimization of the radio and core networks of the Release 10 and beyond of the 3GPP LTE and SAE standards. It looks at the practical description of the Advanced version of the LTE/SAE, how to de-mystify the LTE-Advanced functionality and planning, and how to carry out practical measurements of the system. In general, the book describes how-to-do-it for the 4G system which is compliant with the ITU-R requirements.

LTE Small Cell Optimization Harri Holma, Antti Toskala, Jussi Reunanen, 2015-10-28 LTE network capabilities are enhanced with small cell deployment, with optimization and with new 3GPP features. LTE networks are getting high loaded which calls for more advanced optimization. Small cells have been discussed in the communications industry for many years, but their true deployment is happening now. New 3GPP features in Release 12 and 13 further push LTE network performance. This timely book addresses R&D and standardization activities on LTE small cells and network optimization, focusing on 3GPP evolution to Release 13. It covers LTE small cells from specification to products and field results; Latest 3GPP evolution to Release 13; and LTE optimization

and learnings from the field.

From LTE to LTE-Advanced Pro and 5G Moe Rahnema, Marcin Dryjanski, 2017-09-30 This practical handson new resource presents LTE technologies from end-toend, including network planning and the optimization tradeoff process. This book examines the features of LTE-Advanced and LTE-Advanced Pro and how they integrate into existing LTE networks. Professionals find in-depth coverage of how the air interface is structured at the physical layer and how the related link level protocols are designed and work. This resource highlights potential 5G solutions as considered in releases 14 and beyond, the migration paths, and the challenges involved with the latest updates and standardization process. Moreover, the book covers performance analysis and results, as well as SON specifications and realization. Readers learn about OFDMA, and how DFT is used to implement it. Link budgeting, parameter estimations, and network planning and sizing is explained. Insight into core network architecture is provided, including the protocols and signaling used for both data and voice services. The book also presents a detailed chapter on the end-to-end data transfer optimization mechanisms based on the TCP protocol. This book provides the tools needed for network planning and optimization while addressing the challenges of LTE and LTE-advanced networks.

From GSM to LTE-Advanced Martin Sauter,2014-06-23 This revised edition of Communication Systems from GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband Second Edition (Wiley 2010) contains not only a technical description of the different wireless systems available today, but also explains the rationale behind the different mechanisms and implementations; not only the 'how' but also the 'why'. In this way, the advantages and

also limitations of each technology become apparent. Offering a solid introduction to major global wireless standards and comparisons of the different wireless technologies and their applications, this edition has been updated to provide the latest directions and activities in 3GPP standardization up to Release 12, and importantly includes a new chapter on Voice over LTE (VoLTE). There are new sections on Building Blocks of a Voice Centric Device, Building Blocks of a Smart Phone, Fast Dormancy, IMS and High-Speed Downlink Packet Access, and Wi-Fi-Protected Setup. Other sections have been considerably updated in places reflecting the current state of the technology. • 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

LTE Security Dan Forsberg, Günther Horn, Wolf-Dietrich Moeller, Valtteri Niemi, 2012-11-05 A concise, updated guide to the 3GPP LTE Security Standardization specifications A welcome Revised Edition of the successful LTE Security addressing the security architecture for SAE/LTE, which is based onelements of the security architectures for GSM and 3G, but which needed a major redesign due to the significantly increased complexity, and different architectural and business requirements of fourth generation systems. The authors explain in detail the security mechanisms employed to meet these requirements. The specifications generated by standardization bodies only informabout how to implement the system (and this only to the extent required for interoperability), but almost never inform readers about why things are done the way they are.

Furthermore, specifications tend to be readable only for a small group of experts and lack the context of the broader picture. The book fillsthis gap by providing first hand information from insiders who participated in decisively shaping SAE/LTE security in the relevantstandardization body, 3GPP, and can therefore explain the rationalefor design decisions in this area. A concise, fully updated guide to the 3GPP LTE SecurityStandardization specifications Describes the essential elements of LTE and SAE Security, written by leading experts who participated in decisively shapingSAE/LTE security in the relevant standardization body, 3GPP Explains the rationale behind the standards specificationsgiving readers a broader understanding of the context to thesespecifications Includes new chapters covering 3GPP work on system enhancements for MTC, plus application layer security in ETSI TC M2M andembedded smart card in ETSI SCP: Security for Machine-typeCommunication, Relay Node Security, and Future Challenges, including Voice over LTE, MTC, Home base stations, LIPA/SIPTO, and New Cryptographic Algorithms Essential reading for System engineers, developers and people intechnical sales working in the area of LTE and LTE security, communication engineers and software developers in mobilecommunication field.

LTE and the Evolution to 4G Wireless Agilent Technologies,2013-02-15 A practical guide to LTE design, test and measurement, this new edition has been updated to include the latest developments This book presents the latest details on LTE from a practical and technical perspective. Written by Agilent's measurement experts, it offers a valuable insight into LTE technology and its design and test challenges. Chapters cover the upper layer signaling and system architecture evolution (SAE). Basic

concepts such as MIMO and SC-FDMA, the new uplink modulation scheme, are introduced and explained, and the authors look into the challenges of verifying the designs of the receivers, transmitters and protocols of LTE systems. The latest information on RF and signaling conformance testing is delivered by authors participating in the LTE 3GPP standards committees. This second edition has been considerably revised to reflect the most recent developments of the technologies and standards. Particularly important updates include an increased focus on LTE-Advanced as well as the latest testing specifications. Fully updated to include the latest information on LTE 3GPP standards Chapters on conformance testing have been majorly revised and there is an increased focus on LTE-Advanced Includes new sections on testing challenges as well as over the air MIMO testing, protocol testing and the most up-to-date test capabilities of instruments Written from both a technical and practical point of view by leading experts in the field

LTE Standards Jean-Gabriel Rémy, Charlotte
Letamendia, 2014-09-25 LTE (long-term evolution) mobile
communication system is offering high bitrates in IP
communications. Fourth Generation Mobile
Communications/LTE describes various aspects of LTE as
well as the change of paradigm, which it is bringing to
mobile communications. The book is a vital resource for the
entire mobile communication community. Coverage
includes: LTE standards and architecture, Radio access subsystem, Signaling on the radio path, Macrocells, microcells,
femtocells, SIM card and security, SIM card description, GPS
driven applications, The Apple model, and much more
more.

LTE-Advanced Relay Technology and Standardization Yifei Yuan,2012-07-25 LTE-Advanced relay technology and

standardization provides a timely reference work for relay technology with the finalizing of LTE Release 10 specifications. LTE-Advanced is guickly becoming the global standard for 4G cellular communications. The relay technology, as one of the key features in LTE-Advanced, helps not only to improve the system coverage and capacity, but also to save the costs of laying wireline backhaul. As a leading researcher in the field of LTE-Advanced standards, the author provides an in-depth description of LTE-A relay technology, and explains in detail the standard specification and design principles. Readers from both academic and industrial fields can find sections of interest to them: Sections 2 & 4 could benefit researchers in academia and those who are engaged in exploratory work, while Sections 3 & 4 are more useful to engineers. Dr. Yifei Yuan is the Technical Director at the Standards Department of ZTE Inc.

LTE - The UMTS Long Term Evolution Stefania Sesia. Issam Toufik. Matthew Baker. 2011-07-20 Where this book is exceptional is that the reader will not just learn how LTE works but why it works Adrian Scrase, ETSI Vice-President, International Partnership Projects Following on the success of the first edition, this book is fully updated, covering the latest additions to LTE and the key features of LTE-Advanced. This book builds on the success of its predecessor, offering the same comprehensive system-level understanding built on explanations of the underlying theory, now expanded to include complete coverage of Release 9 and the developing specifications for LTE-Advanced. The book is a collaborative effort of more than 40 key experts representing over 20 companies actively participating in the development of LTE, as well as academia. The book highlights practical implications, illustrates the expected performance, and draws

comparisons with the well-known WCDMA/HSPA standards. The authors not only pay special attention to the physical layer, giving an insight into the fundamental concepts of OFDMA-FDMA and MIMO, but also cover the higher protocol layers and system architecture to enable the reader to gain an overall understanding of the system. Key New Features: Comprehensively updated with the latest changes of the LTE Release 8 specifications, including improved coverage of Radio Resource Management RF aspects and performance requirements Provides detailed coverage of the new LTE Release 9 features, including: eMBMS, duallayer beamforming, user equipment positioning, home eNodeBs / femtocells and pico cells and self-optimizing networks Evaluates the LTE system performance Introduces LTE-Advanced, explaining its context and motivation, as well as the key new features including: carrier aggregation, relaying, high-order MIMO, and Cooperative Multi-Point transmission (CoMP). Includes an accompanying website containing a complete list of acronyms related to LTE and LTE-Advanced, with a brief description of each (http://www.wiley.com/go/sesia theumts) This book is an invaluable reference for all research and development engineers involved in implementation of LTE or LTE-Advanced, as well as graduate and PhD students in wireless communications. Network operators, service providers and R&D managers will also find this book insightful.

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