Book Review

A Comparative Review of the Second and Third Editions of the "Mobile Communications Handbook" (Editor: Jerry Don Gibson)

Gibson, J.D. (editor-in-chief). 1999. The Mobile Communications Handbook. 2nd ed. CRC Press LLC, Boca Raton, FL, USA.
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Gibson, J.D. (editor-in-chief). 2013. Mobile Communications Handbook. 3rd ed. CRC Press, Taylor & Francis Group LLC, Boca Raton, FL, USA.
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The first edition of the handbook was published in 1996 by CRC Press LLC, Boca Raton, FL, USA, in cooperation with IEEE Press, Institute of Electrical and Electronics Engineers (IEEE), Piscataway, NJ, USA.

"The Mobile Communications Handbook", 2nd ed., by Gibson (1999) was released on 23 February 1999 by CRC Press in cooperation with IEEE Press (international standard book number (ISBN): 978-0-8493-8597-1; electronic book ISBN (eBook ISBN): 978-1-4398-7499-8; and digital object identifier (DOI): 10.1201/NOE0849321672). The second edition of the handbook was edited by Jerry Don Gibson, then of the Southern Methodist University, Dallas, TX, USA, and was a part of the Electrical Engineering Handbook Series edited by Richard Carl Dorf, University of California, Davis, CA, USA. The handbook is a mutual work of 49 contributing authors in 36 technical chapters separated into two book sections. The names of the 49 contributing authors in the second edition are listed as they appear in consecutive chapters: Leon W. Couch II, Hwei P. Hsu, Michael L. Honig, Melbourne Barton, John G. Proakis, Joseph LoCicero, Bhasker P. Patel, Giovanni Cherubini, Tor Helleseth, P. Vijay Kumar, Geoffrey C. Orsak, I. J. Fair, V. K. Bhargava, Laurence B. Milstein, Marvin K. Simon, Arogyaswami J. Paulraj, Bernard Sklar, Michael Onufry, Spiros Dimolitsas, Donald C. Cox, Gordon L. Stuber, Bernd-Peter Paris, Seshadri Mohan, Ravi Jain, Yi-Bing Lin,

Michel Daoud Yacoub, Raymond Steele, Bijan Jabbari, James J. Caffery, Roman Pichna, Qiang Wang, Marc Delprat, Vinod Kumar, Lajos Hanzo, Paul Mermelstein, Ira Gerson, Wai-Yip Chan, Toshio Miki, Madhukar Budagavi, Raj Talluri, Suresh Singh, Allen H. Levesque, Kaveh Pahlavan, Matthew Cheng, Li Fung Chang, Bala Rajagopalan, Daniel Reininger, Tero Ojanpera, and Steven D. Gray.

The "Mobile Communications Handbook", 3rd ed., by Gibson (2013) was actually released on 21 August 2012 by CRC Press, Taylor & Francis Group LLC, Boca Raton, FL, USA (international standard book number (ISBN): 978-1-4398-1723-0; electronic book ISBN (eBook ISBN): 978-1-4398-1724-7; and digital object identifier (DOI): 10.1201/b12494). The third edition of the handbook was edited again by Jerry Don Gibson, presently at the University of California, Santa Barbara, CA, USA. It remains a part of the Electrical Engineering Handbook Series edited by Richard Carl Dorf. The handbook is a mutual work of 54 contributing authors in 39 technical chapters separated into five book sections. The names of the 54 contributing authors in the third edition are listed as they appear in consecutive chapters: Bryan Usevitch, Leon W. Couch II, Michael L. Honig, Melbourne Barton, Gordon L. Stüber, Thomas E. Fuja, Emmanuel Abbe, Bixio Rimoldi, Rüdiger Urbanke, Bernard Sklar, John G. Proakis, Giovanni Cherubini, Costas N. Georghiades, Erchin Serpedin, Tor

Helleseth, P. Vijay Kumar, Dinesh Rajan, Rodger E. Ziemer, Geoffrey C. Orsak, Marco Chiani, Donald C. Cox, Bijan Jabbari, Alireza Babaei, Michel Daoud Yacoub, Allen H. Levesque, Kaveh Pahlavan, Giridhar D. Mandyam, Sassan Ahmadi, Jerry Don Gibson, Carl-Erik W. Sundberg, Do-Kyoung Kwon, Madhukar Budagavi, Vivienne Sze, Woo-Shik Kim, Wai-Yip Chan, Tiago H. Falk, Renato Mariz de Moraes, Hamid R. Sadjadpour, Sayantan Choudhury, Jong-Soo Seo, Zhi Ding, Matthew Nokleby, Gareth Middleton, Behnaam Aazhang, Hyunok Lee, Lava N. Al-Doski, Rabindra Ghimire, Seshadri Mohan, Kwang-Cheng Chen, Antonio Servetti, Paolo Bucciol, Juan Carlos De Martin, Upamanyu Madhow and Sumit Singh.

The information obtained from the two editions is used in this book review to describe the similarities and differences between them. An initial quantitative comparison is provided in Table 1. Table 2 shows the titles of book sections in the two editions. Details about twelve chapters which retain their original titles and author(s) in the third edition are included in Table 3.

Table 1. A quantitative comparison between the second and third editions of the handbook.

No.	Item	2nd ed.	3rd ed.
1	Total number of pages	719	813
2	Number of contributing authors	49	54
3	Number of book sections	2	5
4	Number of chapters	36	39

Table 2. Titles of book sections in the two editions.

Book Section	Number of Chapters	
	2nd ed.	3rd ed.
Section I Basic Principles	14	21
Section II Wireless	22	-
Section II Wireless Standards	-	6
Section III Source Compression and Quality Assessment	-	3
Section IV Wireless Networks	-	7
Section V Emerging Applications	-	2

Table 3. List of chapters having the same title and author(s) in both editions.

No.	Chapter Title	Author(s)	Chapter		Book Section		Number of Pages	
			2nd ed.	3rd ed.	2nd ed.	3rd ed.	2nd ed.	3rd ed.
1	Complex Envelope Representations for Modulated Signals	Leon W. Couch II	1	4	1	1	16	16
2	Pulse Code Modulation	Leon W. Couch II	3	2	1	1	14	12
3	Baseband Signaling and Pulse Shaping	Michael L. Honig and Melbourne Barton	4	3	1	1	24	20
4	Channel Equalization	John G. Proakis	5	9	1	1	26	24
5	Echo Cancellation	Giovanni Cherubini	7	10	1	1	16	16
6	Pseudonoise Sequences	Tor Helleseth and P. Vijay Kumar	8	12	1	1	14	16
7	Optimum Receivers	Geoffrey C. Orsak	9	15	1	1	16	14
8	Digital Communication System Performance	Bernard Sklar	13	18	1	1	20	22
9	Modulation Methods	Gordon L. Stüber	16	5	2	1	16	20
10	Rayleigh Fading Channels	Bernard Sklar	18	8	2	1	40	34
11	Cell Design Principles	Michel Daoud Yacoub	21	21	2	1	16	14
12	Wireless Data	Allen H. Levesque and Kaveh Pahlavan	33	22	2	2	16	24

The total number of pages in the second edition of the handbook is 719 pages including initial pages (16 pages), book section contents (6 pages), chapters (678 pages), and Index (19 pages). The total number of pages in the third edition of the handbook is 813 pages including initial pages (16 pages), book section contents (12 pages), chapters (746 pages), Glossary (6 pages) and Index (33 pages). In both editions, a blank even page is added occasionally at the end of some chapters to have an even number of pages in every chapter.

The new title of the handbook is just "Mobile Communications Handbook" and the definite article is omitted from the previous title, "The Mobile Communications Handbook". This is a more humble and appreciated approach reflecting the complexity of modern mobile communications technology and the realization that a single handbook could hardly summarize all the aspects of wireless transmission which are a subject of research, development, implementation and commercial use at present.

Only 746 - 678 = 68 additional chapter pages, or just 10%, are added to the third edition, although global changes in mobile communications occurred between 1999 and 2012. The reason is that a relatively small number of chapters are included again without substantial modifications. The chapters listed in Table 3 are concerned with the basic principles of operation of mobile systems such as modulation and modulated signals, channel noise, receivers and performance evaluation of digital communication systems. The list of references in every chapter is updated and includes more recent scholarly sources.

The information in these chapters is revised and the chapter numbers are reordered. For instance, the chapter on complex envelope representations for modulated signals includes a new section on orthogonal frequency division multiplexing (OFDM) signaling. Also, the examples in the chapter on baseband signaling and pulse shaping, previously addressing the second generation of cellular telecommunication networks and personal access communications systems (PACS), are now related to: wideband code division multiple access (W-CDMA); code division multiple access standard (CDMA 2000), also known as international mobile telecommunications multi-carrier (IMT-MC) standard; wireless local area networks (WLAN); worldwide interoperability for microwave access (WiMAX); and long-term evolution (LTE).

The length of the chapters remains almost the same ±2 pages with the exception of the chapters on modulation methods, Rayleigh fading channels and wireless data. Eleven of the chapters listed in Table 3 are included within Book Section I Basic Principles. The observation that three chapters, concerned with modulation methods, Rayleigh fading channels and cell design principles, are moved to the first book section is indicative of the progress being made in the mobile field and to what extent these topics are to be considered now as basic rather than advanced ones.

In the chapter on modulation methods, the third section on analog frequency modulation is now replaced by quadrature amplitude modulation (QAM). This chapter also includes additional details about orthogonal frequency division multiplexing (OFDM) which at the time of the release of the second edition was in the early stage of implementation while at present it is an inseparable part of the applied wireless multiplexing techniques

The chapter on Rayleigh fading channels contains less pages than before but its content remains intact and there is even an additional example of a direct-sequence spread-spectrum (DS/SS) system using a Rake receiver.

The chapter on wireless data is the only chapter from Table 3 being placed in the next Book Section II Wireless Standards and understandably has much more pages than in the second edition of the handbook. It includes the following new content: an introduction concerned with the evolution of wireless local area networks (WLAN) technology and wide-area mobile data technology; the four generations of cellular technology evolution; wireless data in first-generation (1G) and second-generation (2G) cellular networks; data services in third-generation (3G) networks; and the evolution to fourth-generation (4G) networks with LTE-Advanced and WiMAX technologies.

Table 4. List of new chapters in the third edition.

No.	Chapter Title	Author(s)	Chapter	Book Section	Number of Pages
1	The Discrete Fourier Transform	B. Usevitch	1	1	18
2	Information Theory	E. Abbe, B. Rimoldi, and R. Urbanke	7	1	18
3	Synchronization of Communication Receivers	C.N. Georghiades and Erchin Serpedin	11	1	30
4	Signal Space	R.E. Ziemer	14	1	14
5	MIMO Systems for Diversity and Interference Mitigation	M. Chiani	16	1	20
6	High-Throughput MIMO Systems	M. Chiani	17	1	20
7	Fundamental Limitations on Increasing Data Rate in Wireless Systems	D.C. Cox	19	1	14
8	Interference and Its Impact on System Capacity	B. Jabbari and Alireza Babaei	20	1	20
9	3GPP LTE/LTE-Advanced Radio Access Technologies	S. Ahmadi	24	2	30
10	IEEE 802.16m Radio Access Technology	S. Ahmadi	25	2	32
11	Land Mobile Radio and Professional Mobile Radio: Emergency First Responder Communications	J.D. Gibson	26	2	14
12	Digital Audio Broadcasting	C.-E. W. Sundberg	27	2	10
13	Machine Assessment of Speech Communication Quality	W.-Y. Chan and T.H. Falk	30	3	14
14	Wireless Network Protocols	R. Mariz de Moraes and H.R. Sadjadpour	31	4	12
15	Cross-Layer Design in Wireless Communications	S. Choudhury and Jerry Don Gibson	32	4	12
16	Cooperative Communication Technologies	J.-S. Seo and Z. Ding	33	4	30
17	Cross-Layer Cooperative Communication in Wireless Networks	M. Nokleby, G. Middleton and B. Aazhang	34	4	26
18	Wireless Mesh Networks	H. Lee	35	4	12
19	IP Multimedia Subsystem: Analysis of Scalability and Integration	L. N. Al-Doski, R. Ghimire and S. Mohan	36	4	18
20	Cognitive Radio Networks	K.-C. Chen	37	4	14
21	Vehicular Communications	A. Servetti, P. Bucciol and J.C. De Martin	38	5	18
22	60 GHz Wireless Communication	U. Madhow and S. Singh	39	5	12

Table 4 lists the new chapters in the third edition. The number of chapters in Book Section I Basic Principles is increased from 14 to 21 chapters (Table 2) so that to the 11 retained chapters combined from the two previous book sections (Table 3) are added 8

new chapters (Table 4) and two substantially modified chapters (Table 5) while 4 previous chapters are omitted (Table 6).

The previous Book Section II Wireless is split into four new book sections (Table 2): Book Section II Wireless Standards; Book Section III Source Compression and Quality Assessment; Book Section IV Wireless Networks; and Book Section V Emerging Applications. The said new book sections have the total number of 18 chapters with one retained chapter (Table 3), 14 new chapters (Table 4) and three substantially modified chapters (Table 5) while 15 previous chapters are omitted (Table 6).

The six chapters in Book Section II Wireless Standards (Table 2) comprise one retained chapter (Table 3), 4 new chapters (Table 4) and one substantially modified chapter (Table 5). The three chapters in Book Section III Source Compression and Quality Assessment (Table 2) comprise one retained chapter (Table 3) and two substantially modified chapters (Table 5). Book Section IV Wireless Networks has 7 new chapters and Book Section V Emerging Applications has 2 new chapters (Table 4).

The new chapters are nicely selected. Book Section I Basic Principles starts with a chapter on the discrete Fourier transform. The basics of operational calculus are certainly needed to grasp the mathematical content of the handbook.

The chapter on information theory considers source coding and channel coding. The examples include Hamming codes, low-density parity-check (LDPC) codes and polar codes.

The chapter on synchronization of communication receivers deals with carrier and carrier phase synchronization, carrier acquisition for QAM constellations, and synchronization of MIMO systems.

The chapter on signal space describes the fundamentals of signal space representation and its application to parameter estimation. Wavelet transform, mean-square estimation, the orthogonality principle and Volterra adaptive lattice filtering are subsequently discussed.

The two chapters on multiple-input multiple-output (MIMO) systems for diversity and interference mitigation and high-throughput MIMO systems are a must for understanding systems with multiple antennas. The first one includes essentials about single-input single-output (SISO), single-input multiple-output (SIMO) and multiple-input multiple-output (MIMO) systems as well as diversity techniques. The second one analyses the capacity, throughput and applications of MIMO systems.

The fundamental limitations on increasing data rate in wireless systems are considered in a separate chapter. It provides a comprehensive overview on how the data rate is affected by bandwidth, modulation levels, MIMO, carrier frequency, antenna height, line-of-sight, and multiplexing techniques such as CDMA and time-division multiple access (TDMA).

Interference and its impact on system capacity is the topic of a separate chapter in which the emerging cognitive radio networks are considered as an application.

Technical details about the network architecture, protocol structure, physical layer, layer 2, radio resource control functions, mobility management and handover, and multicarrier operation of 3rd Generation Partnership Project (3GPP) LTE/LTE-Advanced radio access technologies are included in another chapter.

The chapter on IEEE 802.16m Radio Access Technology is a summary of the advanced mobile broadband wireless standard approved by the IEEE Standards Association. There is a description of the WiMAX network architecture followed by details about the protocol structure, mobile station (MS) state diagram, physical layer and media access control (MAC) layer of the IEEE 802.16m standard.

The inclusion of a chapter on land mobile radio (LMR) and professional mobile radio with an emphasis on emergency first responder communications highlights the importance of having reliable means of communication in emergency situations. Although the bandwidth allocation for LMR systems was and still is rather limited, a certain evolution of such systems in the United States (Project 25) and Europe is observed.

There are two new chapters on sound transmission. The first one discusses a multitude of standards for both terrestrial and satellite digital audio broadcasting. The second one concentrates on tests, measurements, algorithms and methods for machine assessment of speech communication quality.

All 7 chapters in Book Section IV Wireless Networks are new starting from the chapter on wireless network protocols which is quite informative in describing the existing MAC protocols and also 4 routing protocols for ad hoc networks. It is followed by a chapter on cross-layer design in wireless communications and its applications. Then cooperative communication technologies are considered in a chapter which concentrates on networks and strategies for cooperative communications, performance comparison of cooperative relays, and cooperative scheduling and resource allocation. Furthermore, cross-layer cooperative communication in wireless networks is the subject of a chapter which describes the benefits of combining the approaches from the previous two chapters. The next chapter considers MAC framework and protocols and performance evaluation of wireless mesh networks. There is also a chapter on the IP multimedia subsystem (IMS) with an analysis of its scalability and integration. The last chapter in the fourth section considers cognitive radio networks and their applications.

The two chapters in the last Book Section V Emerging Applications are definitely new. There is a chapter on vehicular communications followed by a chapter on 60 GHz wireless communication utilizing the millimeter-wave frequency band.

Five substantially modified chapters with similar or closely related titles in both editions and new author(s) are listed in Table 5. In addition to block codes, convolutional codes and turbo codes, the chapter on error control coding has additional sections concerning low-density parity-check (LDPC) codes, coding and bandwidth efficient modulation, and automatic repeat request (ARQ). The section about LDPC codes is especially useful because said codes are routinely being implemented in the majority of existing mobile systems due to: their superior performance at low signal-to-

noise ratio (SNR) for various types of noise; and reduced encoding time at the transmitter. The inclusion of details about ARQ led to a modification of the title of the chapter which was previously entitled "Forward Error Correction Coding".

Introduction to spread spectrum systems is provided in a chapter which logically preserves most of its content and was previously entitled "Spread Spectrum Communications". The main difference is in the inclusion of an additional section concerned with: applications of spread spectrum such as direct-sequence (DS)-CDMA-based cellular systems, Bluetooth and ultrawideband systems; and synchronization issues in spread spectrum systems.

The chapter on speech coding for wireless communications has major modifications in comparison with the previous one which was entitled "Speech and Channel Coding for North American TDMA Cellular Systems" and dealt mainly with analysis-by-synthesis coding techniques such as vector sum excited linear prediction (VSELP) and algebraic code-excited linear prediction (ACELP). After considering the basic issues in speech coding, the modified chapter includes detailed information about speech coding methods such as waveform coding, subband and transform methods, analysis-by-synthesis methods, postfiltering, variable rate coding, and SNR and bandwidth scalable methods. The speech coding standards are described next as follows: ITU-T standards of the International Telecommunication Union (ITU); digital cellular standards; and voice-over-IP (VoIP) standards for the Internet Protocol (IP). Next-generation standards, outstanding issues and future challenges are also addressed. This chapter is one of three chapters dealing with sound transmission. As mentioned earlier, the other two chapters consider separately the aspects of digital audio broadcasting and machine assessment of speech communication quality.

While the chapter previously entitled "Wireless Video Communications" was limited to the error resilient video coding with the MPEG-4 method of the Moving Picture Experts Group (MPEG) and the H.263 video

compression standard, the modified content on video compression now covers the following standards: H.264/AVC for advanced video coding (AVC); H.264/SVC for scalable video coding (SVC); and H.264/MVC for multiview video coding (MVC). There is also a final section concerned with high-efficiency video coding. One of the coauthors of the chapter in the second edition, Madhukar Budagavi, is also a coauthor of the modified chapter.

An air interface overview of the third-generation cellular communications is given in a chapter which is related the previous overview entitled "An overview of cdma2000, WCDMA, and EDGE". The content has been rearranged and updated. In the second edition, CDMA-based schemes were considered first, followed by wideband CDMA (WCDMA), CDMA2000, TDMA-based schemes and Time Division Duplex (TDD). The content in the third edition has a similar logical structure as the system overview begins with the cellular CDMA system of Interim Standard 95 (IS-95). However, the CDMA2000 physical layer is explained next and then there is a new section about the CDMA2000-based 1xEV-DO (evolution-data only) standard. WCDMA and WCDMA channelization are subsequently described. The chapter ends with three new sections concerned with high-speed downlink packet access, high-speed uplink packet access, and the transition to fourth generation.

Table 5. List of substantially modified chapters with similar or closely related titles in both editions and new author(s).

No.	Chapter Title		Author(s)		Chapter		Book Section		Number of Pages	
	2nd ed.	3rd ed.	2nd ed.	3rd ed.	2nd ed.	3rd ed.	2nd ed.	3rd ed.	2nd ed.	3rd ed.
1	Forward Error Correction Coding	Error Control Coding	I. J. Fair and V. K. Bhargava	Thomas E. Fuja	10	6	1	1	18	24
2	Spread Spectrum Communications	Introduction to Spread Spectrum Systems	Laurence B. Milstein and Marvin K. Simon	Dinesh Rajan	11	13	1	1	14	12
3	Speech and Channel Coding for North American TDMA Cellular Systems	Speech Coding for Wireless Communications	Paul Mermelstein	Jerry Don Gibson	28	28	2	3	14	20
4	Wireless Video Communications	Video Compression	Madhukar Budagavi and Raj Talluri	Do-Kyoung Kwon, Madhukar Budagavi, V. Sze and Woo-Shik Kim	31	29	2	3	18	28
5	An Overview of cdma2000, WCDMA, and EDGE	Third-Generation Cellular Communications: An Air Interface Overview	Tero Ojanpera and Steven D. Gray	Giridhar D. Mandyam	36	23	2	2	22	22

Table 6. List of chapters in the second edition not included in the third edition.

No.	Chapter Title	Author(s)	Chapter	Book Section	Number of Pages
1	Sampling	Hwei P. Hsu	2	1	12
2	Line Coding	Joseph LoCicero and Bhasker P. Patel	6	1	20
3	Diversity	Arogyaswami J. Paulraj	12	1	12
4	Telecommunications Standardization	Michael Onufry and Spiros Dimolitsas	14	1	16
5	Wireless Personal Communications: A Perspective	Donald C. Cox	15	2	48
6	Access Methods	Bernd-Peter Paris	17	2	14
7	Space-Time Processing	Arogyaswami J. Paulraj	19	2	10
8	Location Strategies for Personal Communications Services	Seshadri Mohan, Ravi Jain and Yi-Bing Lin	20	2	32
9	Microcellular Radio Communications	Raymond Steele	22	2	18
10	Fixed and Dynamic Channel Assignment	Bijan Jabbari	23	2	8
11	Radiolocation Techniques	James J. Caffery and Gordon L. Stuber	24	2	12
12	Power Control	Roman Pichna and Qiang Wang	25	2	14
13	Enhancements in Second Generation Systems	Marc Delprat and Vinod Kumar	26	2	18
14	The Pan-European Cellular System	Lajos Hanzo	27	2	22
15	The British Cordless Telephone Standard: CT2	Lajos Hanzo	29	2	18
16	Half-Rate Standards	Ira Gerson, Wai-Yip Chan and Toshio Miki	30	2	16
17	Wireless LANs	Suresh Singh	32	2	14
18	Wireless ATM: Interworking Aspects	Melbourne Barton, Matthew Cheng and Li Fung Chang	34	2	22
19	Wireless ATM: QoS and Mobility Management	Bala Rajagopalan and Daniel Reininger	35	2	32

There must be a balance between the contents of consecutive editions and a difficult choice must be made about the omission of information due to certain page limitations. Table 6 lists 19 chapters in the second edition which have not been included in the third edition. Short comments about the topic of each chapter are provided below. The information in said chapters is not entirely omitted from the third edition. In some cases, it has been modified and partially included in other chapters.

For example, the concept of sampling is used in the chapters on the discrete Fourier transform, pulse code modulation, and baseband signaling and pulse shaping.

Also, diversity techniques are considered in MIMO systems for diversity and inter-

ference mitigation and discussed in relation to multiplexing in the final chapter on 60 GHz wireless communication.

The concept of wireless personal communications evolved over time. Nowadays, smart phones, cloud computing, the Internet of Things (IoT), etc., dynamically change the way humans interact with each other. Social networks establish global communities without boundaries. Even communications with virtual entities are made possible with virtual reality networks and the ongoing dissemination of cybertechnology.

The basic access methods such as TDMA, FDMA, and CDMA were further enhanced by the widespread use of OFDMA. OFDMA and MIMO techniques are an essential part of the foundation at the physical layer needed for the reliable operation of LTE-Advanced technologies and fourth generation mobile systems.

Space-time processing became more complex with the introduction of MIMO techniques which are included in all modern wireless standards.

Location strategies for personal communications services were implemented in Interim Standard 41 (IS-41). It can be used not only with second-generation cellular networks but also with CDMA2000.

Microcellular radio communications are far from being obsolete. Microcells and clusters of microcells are considered for a variety of applications including the potential enhancement of the LTE-Advanced standard with cooperative communication technologies such as Coordinated Multi-Point (CoMP) transmission and reception.

Aspects of fixed and dynamic channel assignment are considered in the chapters of the third edition which are related to CDMA and OFDA systems.

Radiolocation techniques are possible with base station (BS) triangulation. A hybrid approach which involves the Global Positioning System (GPS) is applicable mainly for outdoor location tracking. The use of sensors and smart phones is an alternative solution for indoor radiolocation.

Power control is one of the unresolved major issues in mobile communications. The development of algorithms, methods and standards for power control is a subject of intense research and development (R&D). The term green communications is also used in relation to power control. The optimal power management depends on the level of cooperation in wireless communications. Two consecutive chapters in the third edition, dealing with cooperative communication technologies and cross-layer cooperative communication in wireless networks, address to a certain extent the issues of power allocation and energy efficiency.

Enhancements in second generation systems were influential for the development and improvement of third and fourth generation cellular networks. Terms which were used in 1999 like capacity enhancement, quality enhancement and high bit rate data transmission are quite relevant at present. However, the modern enhancements require alternative approaches which are discussed in some sections of separate chapters in the third edition.

The pan-European cellular system in 1999 was still based only on the Global System for Mobile Communications (GSM) for digital circuit switching allowing full duplex voice communications. With the gradual transition to third and fourth generation cellular systems, the GSM networks could become decommissioned in the near future. Until then they will continue to serve the majority of mobile users worldwide.

The British cordless telephone standard (CT-2) was replaced by the standard for Digital Enhanced/European Cordless Telecommunications (DECT).

The status of the half-rate standards is predominantly linked to the future use of GSM networks. In general, half-rate links could prove useful when operating under bandwidth constraints.

Wireless local area networks (WLANs) became widely available at the beginning of the new millennium. They were used extensively to provide connectivity for desktop and laptop computers and currently can be accessed by tablets, smart phones, etc. The chapter on wireless data in the third edition discusses the evolution of WLAN technology.

The two omitted chapters on interworking aspects of wireless asynchronous transfer mode (ATM) and quality of service (QoS) and mobility management of wireless ATM deserve a more thorough discussion. The ATM switching was quite popular during the 1990s but its role diminished shortly afterwards and the anticipated wired delivery of ATM cells directly to the ports of desktop and laptop computers never happened. Instead, the ATM switches were used to establish backbone networks for the Transmission Control Protocol (TCP) and the Internet Protocol (IP) over ATM. However, the splitting of TCP/IP packets into cells and their subsequent transmission became problematic in the case of congestion because the loss of only one cell rendered the entire packet invalid. In wired ATM networks, the cell loss was attributed to relatively rare cell drops at the ATM switch during congestion and an event of cell loss during transmission had negligible probability. Therefore, the eventual use of ATM networks as a backbone in wireless environment could be quite problematic because of frequent cell loss during transmission which would require from the wireless ATM (WATM) standard to allow group cell retransmissions within a specified transmission window for flow control. Frequent wireless retransmissions at low SNR would increase the latency and eliminate the advantages of fast ATM switching. Concurrently, the alternative development of IEEE 801.11 standards for WLAN resulted in their successful implementation. These so-called Wireless Fidelity (Wi-Fi) standards have an optional mechanism for splitting packets into segments.

In summary, the third edition of the Mobile Communications Handbook edited and coauthored by Gibson (2013) is a thought provoking collection of chapters written by established professionals in the field of wireless communications. Their combined effort to describe the concepts of wireless transmission and reception in a systematic way makes the handbook suitable for a broad audience.