Signal Processing for 5G: Algorithms and Implementations
Fa-Long Luo (Editor), Charlie Jianzhong Zhang (Editor)

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DESCRIPTION

A comprehensive and invaluable guide to 5G technology, implementation and practice in one single volume. For all things 5G, this book is a must-read.

Signal processing techniques have played the most important role in wireless communications since the second generation of cellular systems. It is anticipated that new techniques employed in 5G wireless networks will not only improve peak service rates significantly, but also enhance capacity, coverage, reliability, low-latency, efficiency, flexibility, compatibility and convergence to meet the increasing demands imposed by applications such as big data, cloud service, machine-to-machine (M2M) and mission-critical communications.

This book is a comprehensive and detailed guide to all signal processing techniques employed in 5G wireless networks. Uniquely organized into four categories, New Modulation and Coding, New Spatial Processing, New Spectrum Opportunities and New System-level Enabling Technologies, it covers everything from network architecture, physical-layer (down-link and up-link), protocols and air interface, to cell acquisition, scheduling and rate adaption, access procedures and relaying to spectrum allocations. All technology aspects and major roadmaps of global 5G standard development and deployments are included in the book.

Key Features:

• Offers step-by-step guidance on bringing 5G technology into practice, by applying algorithms and design methodology to real-time circuit implementation, taking into account rapidly growing applications that have multi-standards and multi-systems.
• Addresses spatial signal processing for 5G, in particular massive multiple-input multiple-output (massive-MIMO), FD-MIMO and 3D-MIMO along with orbital angular momentum multiplexing, 3D beamforming and diversity.

• Provides detailed algorithms and implementations, and compares all multicarrier modulation and multiple access schemes that offer superior data transmission performance including FBMC, GFDM, F-OFDM, UFMC, SEFDM, FTN, MUSA, SCMA and NOMA.

• Demonstrates the translation of signal processing theories into practical solutions for new spectrum opportunities in terms of millimeter wave, full-duplex transmission and license assisted access.

• Presents well-designed implementation examples, from individual function block to system level for effective and accurate learning.

• Covers signal processing aspects of emerging system and network architectures, including ultra-dense networks (UDN), software-defined networks (SDN), device-to-device (D2D) communications and cloud radio access network (C-RAN).

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**ABOUT THE AUTHOR**

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Dr. Fa-Long Luo is an IEEE Fellow and the Chief Scientist of two leading international companies, headquartered in Silicon Valley, dealing with software-defined radio and wireless multimedia. He is also an Affiliate Full Professor at the University of Washington. From 2007 to 2011, he was the founding editor-in-chief of the International Journal of Digital Multimedia Broadcasting. From 2011 to 2012, he was the chairman of the IEEE Industry DSP Standing Committee and technical board member of the IEEE Signal Processing Society. He is now associate editor of the IEEE Access and IEEE Internet of Things Journal. He has 33 years of research and industry experience in signal processing, multimedia, communication and broadcasting with real-time implementation, applications and standardization and has gained international recognition. He has published 5 books, more than 100 technical papers, and has 18 patents in these fields. He was awarded the Fellowship by the Alexander von Humboldt Foundation of Germany.

**Charlie (Jianzhong) Zhang, Samsung Research America, USA**

Charlie (Jianzhong) Zhang is Vice President and head of the Standards and Research Lab with Samsung Research America at Dallas, where he leads research and standard efforts for 5G cellular systems and next generation multimedia networks. From Aug 2009 to Aug 2013, he served as the Vice Chairman of 3GPP RAN1 working group and led development of LTE and LTE-Advanced technologies such as 3D channel modeling, UL-MIMO and CoMP, Carrier Aggregation for TD-LTE, etc. Before joining Samsung, he was with Motorola from 2006 to 2007 working on 3GPP HSPA standards, and with Nokia Research Center from 2001 to 2006.
working on IEEE 802.16e (WiMAX) standard and EDGE/CDMA algorithms. He received his Ph.D. degree from the University of Wisconsin, Madison. Dr. Zhang is also an IEEE Fellow.

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