

Mobile Broadband

Including WiMAX and LTE

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Preface

This book attempts to provide an overview of IP-OFDMA technology, commencing with cellular and IP technology for the uninitiated, while endeavoring to pave the way toward OFDMA theory and emerging technologies, such as WiMAX, LTE, and beyond. The first half of the book ends with OFDM technology, and the second half of the book is targeted at more advanced readers, providing research and development-oriented outlook by introducing OFDMA and MIMO theory and end-to-end system architectures of IP- and OFDMA-based technologies.

The book comprises 13 chapters divided into three parts. Part I – constituted by Chaps. 1–3 – is a rudimentary introduction for those requiring a background in the field of cellular communication and All-IP Networking. Chapter 1 is introductory and is dedicated to discussing the history of cellular communications and the trend toward mobile broadband. Chapter 2 provides an overview of cellular communication with key insights to wireless challenges and features. Chapter 3 provides the same for IP networking.

Part II is comprised of Chaps. 4–7. Following an introduction to orthogonal frequency division multiplexing (OFDM) in Chap. 4, Chap. 5 is one of the core chapters of the book where orthogonal frequency division multiple access (OFDMA) is introduced in detail with resource allocation schemes. Chapter 6 talks about MIMO technologies and Chap. 7 introduces single-carrier frequency division multiple access (SC-FDMA) scheme – an OFDMA variant considered for uplink in LTE.

Part III, including Chaps. 8–13, introduces OFDMA-based access technologies. IEEE 802.16e-2005 based mobile WiMAX physical layer is described in Chap. 8, while IEEE 802.16e-2005 based mobile WiMAX medium access layer is detailed in Chap. 9. This is followed by Chap. 10, which concentrates on the networking layer specified by WiMAX Forum. Chapter 11 introduces air interface and networking framework of long-term evolution (LTE) out of Third Generation Partnership Project (3GPP), which is then followed by Chap. 12 that talks briefly about that of ultra mobile broadband (UMB) out of 3GPP2. In Chap. 13, we conclude the book with interworking solutions of access schemes presented earlier together with common IMS and PCC functions. In addition, we review future OFDMA-based technologies such as upcoming IEEE 802.16j and IEEE 802.16m for multihop relay and

advanced air interface respectively as amendments to WiMAX. We then talk about IEEE 802.20 as a complement to UMB and cognitive radio-based IEEE 802.22 for wireless regional area networks.

The purpose of this book is to provide a comprehensive guide to researchers, engineers, students, or anyone else who is interested in the development and deployment of next generation OFDMA-based mobile broadband systems. The book targets to focus on a rapidly evolving area, and we have tried to keep it with up-to-date information. Despite the efforts to provide the text error free, for any errors that remain, comments and suggestions are welcome, which the will be used for preparing future editions. I can be reached via email at ergen@cal.berkeley.edu.

Finally, I thank my colleagues and my family for their constant support and patience. This book is dedicated to them.

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