

Preface

LTE has become the most successful mobile wireless broadband technology, serving over one billion users as of the beginning of 2016 and handling a wide range of applications. Compared to the analog voice-only systems 25 years ago, the difference is dramatic. Although LTE is still at a relatively early stage of deployment, the industry is already well on the road toward the next generation of mobile communication, commonly referred to as the fifth generation or 5G. Mobile broadband is, and will continue to be, an important part of future cellular communication, but future wireless networks are to a large extent also about a significantly wider range of use cases and a correspondingly wider range of requirements.

This book describes LTE, developed in 3GPP (*Third-Generation Partnership Project*) and providing true fourth-generation (4G) broadband mobile access, as well as the new radio-access technology 3GPP is currently working on. Together, these two technologies will provide 5G wireless access.

Chapter 1 provides a brief introduction, followed by a description of the standardization process and relevant organizations such as the aforementioned 3GPP and ITU in Chapter 2. The frequency bands available for mobile communication are also covered, together with a discussion on the process for finding new frequency bands.

An overview of LTE and its evolution is found in Chapter 3. This chapter can be read on its own to get a high-level understanding of LTE and how the LTE specifications evolved over time. To underline the significant increase in capabilities brought by the LTE evolution, 3GPP introduced the names LTE-Advanced and LTE-Advanced Pro for some of the releases.

Chapters 4–11 cover the basic LTE structure, starting with the overall protocol structure in Chapter 4 and followed by a detailed description of the physical layer in Chapters 5–7. The remaining Chapters 8–11, cover connection setup and various transmission procedures, including multi-antenna support.

Some of the major enhancements to LTE introduced over time is covered in Chapters 12–21, including carrier aggregation, unlicensed spectrum, machine-type communication, and device-to-device communication. Relaying, heterogeneous deployments, broadcast/multicast services, and dual connectivity multi-site coordination are other examples of enhancements covered in these chapters.

Radio frequency (RF) requirements, taking into account spectrum flexibility and multi-standard radio equipment, is the topic of Chapter 22.

Chapters 23 and 24 cover the new radio access about to be standardized as part of 5G. A closer look on the requirements and how they are defined is the topic of Chapter 23, while Chapter 24 digs into the technical realization.

Finally, Chapter 25 concludes the book and the discussion on 5G radio access.