Preface

It is more than a decade since GSM was first commercially available. After some unexpected delay, it seems that finally UMTS is here to stay as a 3G system standardised by 3GPP, at least for another ten years. UMTS will enable multi-service, multi-rate and flexible IP native-based mobile technologies to be used in wide area scenarios and also pave the way for a smooth transition from circuit switched voice networks to mobile packet services.

The scarcity of available spectrum, particularly as seen in the auctions and beauty contests that preceded the final licences allocation for UMTS operators, has revealed, to a larger extent than in the past, the importance of using the spectrum efficiently. Radio access systems such as UTRAN in UMTS certainly exploit higher system spectrum efficiencies than 1G and 2G by using advanced coding, multiple access, diversity schemes, etc.

On the other hand, the WCDMA technique adopted in UTRAN makes the accurate control of the inherent interference generated by this access a key issue in the good behaviour of the system. In addition, the inherent flexibility and high user bit rates provided by UMTS makes this interference control even more difficult. Therefore, manufacturers have to introduce, on a proprietary basis, much more involved Radio Resource Management (RRM) strategies than those used in the past, so that an efficient use of the available spectrum can be achieved. A complete picture of these RRM techniques has to include the retention of the QoS per service at the agreed values as an ultimate trade-off. Certainly, handling interference in UMTS will take the place of frequency planning in 1G and 2G systems to a much greater extent and will be one of the most important tasks if operators are to run the system efficiently.

This self-contained book, consisting of six chapters, intends to bring to the reader, in a comprehensive and systematic way, the material needed to understand the interiorities of the RRM strategies in the context of UMTS. This book is addressed to undergraduate students, engineers and researchers who would like to explore the UMTS world and learn how to run and improve its radio access part in an operative scenario. Although a short radio planning basis is provided, RRM concepts are actually exploited in different scenarios that go beyond the planning pre-operational stages so that eventually the radio resources can be efficiently exploited in a near real time operation.

The organisation of the book is represented schematically overleaf. In particular, Chapter 1 provides the introduction to the mobile communications sector and to UMTS, including the evolution towards the 4G systems. Also, it provides an overview of the QoS concept, which is key for the definition of Radio Resource Management strategies. After this introduction, the book is split into two different paths. The first path, which includes Chapters 2 and 4, is intended to provide the required theoretical fundamentals while the second, including Chapters 3, 5 and 6, presents to the reader how these theoretical aspects are translated into practical algorithms and systems. In that sense, Chapters 2 and 3 cover the characterisation of the radio access in UMTS. Specifically, Chapter 2 provides a brief description of the CDMA technique that constitutes the basis for the UMTS radio access network. In turn, Chapter 3 presents the
detailed description of the UMTS radio interface, focusing on the UTRAN FDD mode. After this characterisation, the following chapters focus on the Radio Resource Management concepts. In particular, Chapter 4 provides the theoretical background for the development of RRM strategies in WCDMA, which serves as a basis for the description of specific RRM algorithms in Chapter 5. Such algorithms are analysed in a variety of scenarios to identify the key parameters and factors that influence their performance. Finally, Chapter 6 provides the evolution of UMTS towards ‘Beyond 3G’ systems and explores the concept of Common RRM in heterogeneous networks, including some algorithm examples.