

# Preface

To accommodate the ever-increasing demand for mobile data, the wireless industry is facing with the urgent requirement of growing the capacity of mobile access networks by 1, 000 times. The extreme densification of small cells is currently the big hope to resolve the unprecedented “1000× data challenge” and to provide ubiquitous network coverage with an optimized grade of service. Small-cell heterogeneous networks represent a paradigm shift from the traditional centralized macrocell approach to a more self-organized solution, where small cells are deployed in conjunction with existing large cells at all possible venues, indoors and outdoors, and in all types and sizes. However, the coexistence of different types of network devices with diverse specifications on the same spectrum raises a new set of major design issues. These critical challenges urgently need to be solved to fully realize the promised benefits of small-cell solutions.

This SpringerBrief covers two important aspects of the emerging small-cell wireless heterogeneous networks. First, the architectures of small-cell networks are reviewed, with specific references to the current wireless network standards. Second, new adaptive power control and dynamic spectrum access techniques are discussed to promote a harmonized coexistence of diverse network entities in both 3G and 4G small-cell networks. Analytically devised from optimization and game theories, these autonomous solutions are shown to effectively manage the severe intra-tier and cross-tier interferences in small cells. The target audience of this informative and practical SpringerBrief is researchers and professionals working in wireless networking and interference management. The content is also valuable for advanced-level students interested in network communications and radio resource allocation.

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Finally, we dedicate this work to our families.

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