Preface

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VER the last few years, the demand for service provi-
sion via the wireless communication bearer has risen beyond all expectations. This fact introduces one of the most demanding technological challenges: the need to in-crease the spectrum efficiency of wireless networks. Whereas great effort until today has been focused toward the development of modulation methods, coding tech-niques, communication protocols, and so forth, the an-tenna-related technology has received significantly less at-tention up to now. Nevertheless, in order to achieve the ambitious requirements introduced for future wireless sys-tems, new "intelligent" or "self-configured" and highly efficient systems will most certainly be required. In the pursuit for schemes that will solve these problems, atten-tion has recently turned to spatial filtering methods using advanced antenna techniques: adaptive or "smart" anten-nas. Filtering in the space domain can separate spectrally and temporally overlapping signals from multiple mobile units, and hence the spatial dimension can be exploited as a hybrid multiple access technique complementing the basic underlying multiple access technique.
Adaptive antennas have been studied for many years by the sonar and radar research communities as interference-resistant aids (the first known case of an adaptive antenna dates back to 1959: L. C. Van Atta, Electromagnetic Reflec-tion, U.S. Patent 29080002, October 6, 1959), and their main application until recently has been military. Advances in processor cost and speed have only recently made it possible to overcome the major obstacle of hardware cost and complexity and start considering the possibility of applying this technique to commercial communications. This book targets a very wide audience. It can be used as a reference source (e.g., in conjunction with other texts on signal processing, antennas, mobile communications) for students at the undergraduate and/or postgraduate level, academics, researchers, professionals, and managers who either are specifically interested or want to understand general aspects of this technology. In order to achieve these goals, a large number of published works on a variety
of issues related to adaptive antennas have been gathered. The papers included in this volume, along with the cited references, constitute a very detailed source of information dealing with almost all the important issues related to this

technology. The key areas are separated in six chapters as follows:

Chapter 1: One introductory paper that provides impor-tant background information on adaptive antennas, fol-lowed by three papers with the channel models necessary for simulations and material dealing with the spatial characteristics of the radio channel for different opera-tional environments.

Chapter 2: Nineteen papers with the most representa-tive, widely used and researched adaptive methods and algorithms such as MUSIC, ESPRIT, and SAGE. Chapter 3: Twenty-seven papers dealing with the issue that has attracted most of the attention in terms of re-search up to now, the performance of adaptive antennas with different adaptive methods and algorithms under a variety of conditions in mobile communication envi-ronments.

Chapter 4: Thirteen papers dealing with implementation issues for adaptive antennas: beamforming techniques, calibration, mutual coupling, nonlinearity problems, and so forth.

Chapter 5: Eight papers presenting experimental results for issues related to this technology, mainly from adap-tive antenna test beds.

Chapter 6: Six papers that deal with more general issues related to adaptive antennas such as specific applications for user location, indoor wireless high data rate net-works, planning issues for adaptive antennas, and novel techniques that seem promising to open new directions for this technology in the future.

The work included in the different chapters is sorted chronologically except for papers that present overviews or comparisons for the issues of focus in a chapter. The latter are always at the beginning of the chapter.
I sincerely hope that you find this source of reference useful. If it manages to stimulate you and as a result opens new horizons for you in this very exciting and promising area, then it will have succeeded in its purpose.

George V. Tsoulos

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