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Introduction and Outline

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1. Introduction

Due to the rapid development of wireless communication, in particular, for LTE, antennas with multiband and wideband are required to support various wireless communication services. Besides the requirement of multiband and wideband operation, modern wireless transceivers place increasing demands (such as low-profile, low cost, conformal, and compact design) on antennas used within them. To meet all these desirable attributes, sophisticated metamaterials are used to design antennas. Therefore, understanding the properties of these materials is important to get involved in designing such antennas. In addition, there is a significant progress on bandwidth enhancement, size reduction, and generation of circular polarization of conventional antennas. This book covers a range of topics and addresses the requirements for modern antennas including compactness, space constraints, desired radiation pattern, low cost, light weight, multiband operation, reconfigurability, and stable performance under different conditions while designing such antennas.

2. Outline of research contributions

This book attempts to present cutting-edge research in the field of antennas for modern wireless communications.

In *“Recent Computer Aided Design Techniques for Rectangular Microstrip Antenna,”* the author explores a more accurate tool for characterization and design of rectangular microstrip antenna for wireless communication.

In *“Metamaterial Antennas for Wireless Communications Transceivers,”* the authors present a novel hexa-band CPW-fed antenna which consists of asymmetric fork-shaped radiating elements incorporating U-shaped radiators with a slit. Each of the branched radiators generates

triple resonant frequencies within the L, S, C, and X bands. The antenna exhibits good return loss, gain, and radiation patterns, which makes it an excellent candidate for multiband and broadband communication applications.

In *“Application of Composite Right-/Left-Handed Metamaterials in Leaky Wave Antennas,”* the authors report the recent works in the area of CRLH metamaterials (MTM) leaky wave antennas (LWAs). These works include the application of electronic control, substrate integrated waveguides, dual-band and wideband performance, ferrite loaded waveguides, and split-ring-resonator-based MTMs in LWAs.

In *“Planar Antennas with Enhanced Bandwidth and Radiation Characteristics,”* the authors present novel wideband and ultra-wideband (UWB) antennas which are based on loading the background plane of a monopole radiator with concentric split-ring resonators. The modification of monopole radiator improves the fractional bandwidth of the antenna from 41 to 87%; in particular, the operational bandwidth of the proposed antennas is double that of a conventional monopole antenna of the same size.

In *“Compact Antenna with Enhanced Performances Using Artificial Meta-Surfaces,”* the authors explore novel mechanisms of enhancing the antenna bandwidth, achieving circular polarization radiation, and realizing beam manipulation, and demonstrate theoretical analysis, numerical calculation, and experimental measurement.

In *“A Circularly Polarized Spiral/Loop Antenna and its Simple Feeding Mechanism,”* a simple spiral/loop antenna radiating circular polarization is introduced. To design such CP antenna, the authors first choose a loop antenna that is arranged like a cross shape for radiating CP waves. Then, the cross-shaped loop antenna is fed by a dipole antenna for achieving wide beam-widths, multipolarization, and stable feedings.

In *“Omnidirectional Circularly Polarized Antenna with High Gain in Wide Bandwidth,”* two kinds of omnidirectional circularly polarized slot array antenna with nearly constant good gain across wide bandwidth are presented—one is a single CP polarized antenna, and the other one is the dual CP omnidirectional antenna. These antennas have perfectly symmetric structure, so they are easy to change the working frequency band by changing the size of the antenna. Due to the omnidirectional coverage and dual CP characteristics, the antennas are valuable in the RF receiver.

In *“A Simple EM Dipole Radiating Element for Dual-Polarized Phased Array Weather Radars,”* the authors present dual-polarized radiating element. In their design, the magnetic dipole is constructed by a simple loop with capacitive loading which maintains uniform surface current, whereas the electric dipole is in the form of printed dipole.

In *“Microswitch Design and Its Optimization Using Pattern Search Algorithm for Application in Reconfigurable Antenna,”* the authors present the design of metal contact RF microswitch for application in the reconfigurable antenna. The reconfigurable antenna is fabricated and the results are reported in this chapter which shows a good agreement between simulation and measurement.

3. Conclusion

It is well known that the field of antenna engineering has been advancing at a remarkable pace to support modern communication systems. Recently, significant progress has been made in the development of new antenna structures and techniques targeted for modern wireless applications. The book presents the current development of antenna systems in hoping that graduate students as well as practicing engineers will find this book informative and worth reading.

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