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## Proceedings of the International Conference on Soft Computing Systems

### ICSCS 2015, Volume 2

**Springer** *The book is a collection of high-quality peer-reviewed research papers presented in International Conference on Soft Computing Systems (ICSCS 2015) held at Noorul Islam Centre for Higher Education, Chennai, India. These research papers provide the latest developments in the emerging areas of Soft Computing in Engineering and Technology. The book is organized in two volumes and discusses a wide variety of industrial, engineering and scientific applications of the emerging techniques. It presents invited papers from the inventors/originators of new applications and advanced technologies.*

## Antennas and Propagation for Body-Centric Wireless Communications, Second Edition

**Artech House** *Now in a newly updated and revised edition, this timely resource provides you with complete and current details on the theory, design, and applications of wireless antennas for on-body electronic systems. The Second Edition offers readers brand new material on advances in physical phantom design and production, recent developments in simulation methods and numerical phantoms, descriptions of methods for simulation of moving bodies, and the use of the body as a transmission channel. You also find a completely revised chapter on channel characterization and antenna design at microwave frequencies. This cutting-edge volume brings you the state-of-the-art in existing applications like Bluetooth headsets together with detailed treatment of techniques, tools, and challenges in developing on-body antennas for an array of medical, emergency response, law enforcement, personal entertainment, and military applications on the horizon. The book briefs you on energy propagation around and into the body and how to estimate performance of on-body wireless links, and then dives into the nuts-and-bolts of designing antenna systems that deliver the goods. It covers on-body communication channels at microwave frequency bands and at low frequency bands, as well as ultra wideband systems for WPANs and WBANs. You get details on body-centric UWB antennas and channels, as well as advances in wearable mobile, EBG, and "smart fabric" antennas for cellular and WLAN communications. Chapters on telemedicine applications, such as remote diagnoses, and implantable medical devices cover crucial propagation issues and other obstacles that need to be addressed. Rounding out the coverage is a section on antenna design for body-sensor networks and their emerging military and space applications. Packed with hands-on guidance from noted experts, this volume will be indispensable for your efforts in designing and improving body-centric communication systems.*

## Antennas for Portable Devices

**John Wiley & Sons** *Offers a comprehensive and practical reference guide to antenna design and engineering for portable devices Antennas are often the most bulky components in many portable wireless devices such as mobile phones. Whilst the demand for ever smaller and more powerful wireless devices increases, as does the importance of designing and engineering smaller antennas to fit*

these devices. *Antennas for Portable Devices* provides a complete and cutting-edge guide to the design and engineering of small antennas for portable electronic devices such as mobile phone handsets, laptop computers, RFID (radio frequency identification), microwave thermal therapies devices, wearable devices, and UWB (ultra-wideband) based consumer devices. The book addresses practical engineering issues that antenna professionals have to deal with. It explains the immediate demands for existing systems; discusses the antenna technology for the latest and emerging applications, and gives comprehensive coverage of hot topics in the wireless industry. Issues including design considerations, engineering design, measurement setup and methodology, and practical applications are all covered in depth. *Antennas for Portable Devices: Covers antennas for all modern portable wireless devices from handsets, RFID tags, laptops, wearable sensors, UWB-based wireless USB dongles and handheld microwave treatment devices Explains how to design and engineer applications for miniaturization of antenna technology, utilising practical case studies to provide the reader with an understanding of systems and design skills Links the basic antenna theory, with design methodology, and engineering design Is amply illustrated with numerous figures and data tables of antenna designs to aid understanding Features contributions from industry and research experts in antenna technology and applications This invaluable resource will provide a comprehensive overview of miniaturizing antenna technology for antenna engineers in industry, and R&D organizations, graduate students, consultants, researchers, RF professionals, technical managers, as well as practitioners working in the area of consumer electronics, RF systems, wireless communications, or bio-medical devices.*

## Antenna Fundamentals for Legacy Mobile Applications and Beyond

**Springer** *This book highlights technology trends and challenges that trace the evolution of antenna design, starting from 3rd generation phones and moving towards the latest release of LTE-A. The authors explore how the simple monopole and whip antenna from the GSM years have evolved towards what we have today, an antenna design that is compact, multi-band in nature and caters to multiple elements on the same patch to provide high throughput connectivity. The scope of the book targets a broad range of subjects, including the microstrip antenna, PIFA antenna, and the monopole antenna to be used for different applications over three different mobile generations. Beyond that, the authors take a step into the future and look at antenna requirements for 5G communications, which already has the 5G drive in place with prominent scenarios and use-cases emerging. They examine these, and put in place the challenges that lie ahead for antenna design, particularly in mm-Wave design. The book provides a reference for practicing engineers and under/post graduate students working in this field.*

## Reconfigurable Antennas

**Morgan & Claypool Publishers** *This lecture explores the emerging area of reconfigurable antennas from basic concepts that provide insight into fundamental design approaches to advanced techniques and examples that offer important new capabilities for next-generation applications. Antennas are necessary and critical components of communication and radar systems, but sometimes their inability to adjust to new operating scenarios can limit system performance. Making antennas reconfigurable so that their behavior can adapt with changing system requirements or environmental conditions can ameliorate or eliminate these restrictions and provide additional levels of functionality for any system. For example, reconfigurable antennas on portable wireless devices can help to improve a noisy connection or redirect transmitted power to conserve battery life. In large phased arrays, reconfigurable antennas could be used to provide additional capabilities that may result in wider instantaneous frequency bandwidths, more extensive scan volumes, and radiation patterns with more desirable side lobe distributions. Written for individuals with a range of experience, from those with only limited prior knowledge of antennas to those working in the field today, this lecture provides both theoretical foundations and practical considerations for those who want to learn more about this exciting subject.*

## Microstrip and Printed Antennas: Applications-Based Designs

**Artech House** *This comprehensive resource presents antenna fundamentals balanced with the design of printed antennas. Over 70 antenna projects, along with design dimensions, design flows and antenna performance results are discussed, including antennas for wireless communication, 5G antennas and beamforming. Examples of smartphone antennas, MIMO antennas, aerospace and satellite remote sensing array antennas, automotive antennas and radar systems and many more printed antennas for various applications are also included. These projects include design dimensions and parameters that incorporate the various techniques used by industries and academia. This book is intended to serve as a practical microstrip and printed antenna design guide to cover various real-world applications. All Antenna projects discussed in this book are designed, analyzed and simulated using full-wave electromagnetic solvers. Based on several years of the author's research in antenna design and development for RF and microwave applications, this book offers an in-depth coverage of practical printed antenna design methodology for modern applications.*

# Antenna Design for Narrowband IoT: Design, Analysis, and Applications

## Design, Analysis, and Applications

**IGI Global** In internet of things (IoT) applications, wireless connectivity is a key factor, particularly those that need to be in transition, or where wired communication is not effective or practicable. For top-notch connectivity of the Narrowband IoT (NB-IoT) standard, the 900MHz frequency is generally used by most of the vendors. The radiation quality not only depends on the antenna geometry but on immediate surroundings. Additionally, the IoT product itself and the user of the product can strongly affect the resulting radiation pattern and other characteristics of the antenna. On the other hand, a suitable antenna should also have high efficiency and adequate bandwidth covering the desired frequency range. To take these effects into consideration, the whole IoT product must be included in the antenna simulations. *Antenna Design for Narrowband IoT: Design, Analysis, and Applications* provides the antenna design concept for narrowband internet of things applications, performs a detailed analysis of the antenna, and discusses the various antenna design concepts and structures. Covering a range of topics such as antenna design and antenna measurement systems, this book is ideal for industry professionals, research scholars, academicians, professors, and students.

## Modern Antenna Design

**John Wiley & Sons** A practical book written for engineers who design and use antennas. The author has many years of hands-on experience designing antennas that were used in such applications as the Venus and Mars missions of NASA. The book covers all important topics of modern antenna design for communications. Numerical methods will be included but only as much as are needed for practical applications.

# Handbook of Reflector Antennas and Feed Systems Volume III: Applications of Reflectors

**Artech House** This is the first truly comprehensive and most up-to-date handbook available on modern reflector antennas and feed sources for diversified space and ground applications. There has never been such an all-encompassing reflector handbook in print, and no currently available title offers coverage of such recent research developments. The Handbook consists of three volumes. Volume III focuses on the range of reflector antenna applications, including space, terrestrial, and radar. The intent of this book volume is to provide practical applications and design information on reflector antennas used for several communications systems. This book covers recent developments of reflector antennas used for satellite communications, terrestrial communications, and remote sensing applications. New subjects are introduced for the first time, including satellite antennas, Terahertz antennas, PIM, multipaction, corona, deployable mesh reflector antennas, and mechanical aspects of reflector antennas. In addition, this book contains a separate topic on integrated feed assembly for reflector antennas covering analysis, design, fabrication, and test.

## Emerging Innovations in Microwave and Antenna Engineering

**IGI Global** Continuing advancements in electronics creates the possibility of communicating with more people at greater distances. Such an evolution calls for more efficient techniques and designs in radio communications. *Emerging Innovations in Microwave and Antenna Engineering* provides innovative insights into theoretical studies on propagation and microwave design of passive and active devices. The content within this publication is separated into three sections: the design of antennas, the design of the antennas for the RFID system, and the design of a new structure of microwave amplifier. Highlighting topics including additive manufacturing technology, design application, and performance characteristics, it is designed for engineers, electricians, researchers, students, and professionals, and covers topics centered on modern antenna and microwave circuits design and theory.

## Microstrip Antennas

**BoD - Books on Demand** In the last 40 years, the microstrip antenna has been developed for many communication systems such as radars, sensors, wireless, satellite, broadcasting, ultra-wideband, radio frequency identifications (RFIDs), reader devices etc. The progress in modern wireless communication systems has dramatically increased the demand for microstrip antennas. In this book some recent advances in microstrip antennas are presented.

## Circularly Polarized Antennas

**John Wiley & Sons** This book presents a comprehensive insight into the design techniques for different types of CP antenna elements and arrays In this book, the authors address a broad range of topics on circularly polarized (CP) antennas. Firstly, it introduces to the reader basic principles, design techniques and characteristics of various types of CP antennas, such as CP patch antennas, CP helix antennas, quadrifilar helix antennas (QHA), printed quadrifilar helix antennas (PQHA), spiral antenna, CP slot antennas, CP dielectric resonator antennas, loop antennas, crossed dipoles, monopoles and CP horns. Advanced designs such as small-size CP antennas, broadband, wideband and ultra-wideband CP antennas are also discussed, as well as multi-band CP antennas and dual CP antennas. The design and analysis of different types of CP array antennas such as broadband CP patch arrays, dual-band CP arrays, CP printed slot arrays, single-band and multi-band CP reflectarrays, high-gain CP waveguide slot antennas, CP dielectric resonator antenna arrays, CP active arrays, millimetre-waveband CP arrays in LTCC, and CP arrays with electronically beam-switching or beam-steering capabilities are described in detail. Case studies are provided to illustrate the design and implementation of CP antennas in practical scenarios such as dual-band Global Navigation Satellite Systems (GNSS) receivers, satellite communication mobile terminals at the S-band, Radio Frequency Identification (RFID) readers at 2.4 GHz, and Ka-band high-speed satellite communication applications. It also includes the detailed designs for a wideband Logarithmic spiral antenna that can operate from 3.4-7.7 GHz. In addition, the book offers a detailed review of the recent developments of different types of CP antennas and arrays. Presents comprehensive discussions of design techniques for different types of CP antennas: small-size CP antennas, broadband CP antennas, multi-band CP antennas and CP arrays. Covers a wide range of antenna technologies such as microstrip antennas, helix, quadrifilar helix antenna, printed quadrifilar helix antenna, dielectric resonator antennas, printed slots, spiral antennas, monopoles, waveguide slot arrays, reflectarrays, active arrays, millimetre-wave arrays in LTCC, electronically beam-switching arrays and electronically beam-steerable arrays. Reviews recent developments in different types of CP antennas and arrays, reported by industries, researchers and academics worldwide. Includes numerous case studies to demonstrate how to design and implement different CP antennas in practical scenarios. Provides both an introduction for students in the field and an in-depth reference for antenna/RF engineers who work on the development of CP antennas. Circularly Polarized Antennas will be an invaluable guide for researchers in R&D organizations; system engineers (antenna, telecom, space and satellite); postgraduates studying the subjects of antenna and propagation, electromagnetics, RF/microwave/millimetre-wave systems, satellite communications and so on; technical managers and professionals in the areas of antennas and propagation.

## Microstrip and Printed Antenna Design, 2nd Edn

**IET** Offering extensive coverage of microstrip antennas, from rectangular and circular to broadband and dual-band, this text gives a complete introduction to useful designs and the implementation aspects of these types of antennas.

## Proceedings of International conference on Antenna Technologies

**Allied Publishers**

## Handbook of Research on Recent Developments in Intelligent Communication Application

**IGI Global** The communication field is evolving rapidly in order to keep up with society's demands. As such, it becomes imperative to research and report recent advancements in computational intelligence as it applies to communication networks. The Handbook of Research on Recent Developments in Intelligent Communication Application is a pivotal reference source for the latest developments on emerging data communication applications. Featuring extensive coverage across a range of relevant perspectives and topics, such as satellite communication, cognitive radio networks, and wireless

sensor networks, this book is ideally designed for engineers, professionals, practitioners, upper-level students, and academics seeking current information on emerging communication networking trends.

## Antenna-in-Package Technology and Applications

**John Wiley & Sons** A comprehensive guide to antenna design, manufacturing processes, antenna integration, and packaging Antenna-in-Package Technology and Applications contains an introduction to the history of AiP technology. It explores antennas and packages, thermal analysis and design, as well as measurement setups and methods for AiP technology. The authors—well-known experts on the topic—explain why microstrip patch antennas are the most popular and describe the myriad constraints of packaging, such as electrical performance, thermo-mechanical reliability, compactness, manufacturability, and cost. The book includes information on how the choice of interconnects is governed by JEDEC for automatic assembly and describes low-temperature co-fired ceramic, high-density interconnects, fan-out wafer level packaging-based AiP, and 3D-printing-based AiP. The book includes a detailed discussion of the surface laminar circuit-based AiP designs for large-scale mm-wave phased arrays for 94-GHz imagers and 28-GHz 5G New Radios. Additionally, the book includes information on 3D AiP for sensor nodes, near-field wireless power transfer, and IoT applications. This important book: • Includes a brief history of antenna-in-package technology • Describes package structures widely used in AiP, such as ball grid array (BGA) and quad flat no-leads (QFN) • Explores the concepts, materials and processes, designs, and verifications with special consideration for excellent electrical, mechanical, and thermal performance Written for students in electrical engineering, professors, researchers, and RF engineers, Antenna-in-Package Technology and Applications offers a guide to material selection for antennas and packages, antenna design with manufacturing processes and packaging constraints, antenna integration, and packaging.

## Advanced Radio Frequency Antennas for Modern Communication and Medical Systems

**BoD - Books on Demand** The main objective of this book is to present novel radio frequency (RF) antennas for 5G, IOT, and medical applications. The book is divided into four sections that present the main topics of radio frequency antennas. The rapid growth in development of cellular wireless communication systems over the last twenty years has resulted in most of world population owning smartphones, smart watches, I-pads, and other RF communication devices. Efficient compact wideband antennas are crucial in RF communication devices. This book presents information on planar antennas, cavity antennas, Vivaldi antennas, phased arrays, MIMO antennas, beamforming phased array reconfigurable Pabry-Perot cavity antennas, and time modulated linear array.

## Antenna and Sensor Technologies in Modern Medical Applications

**John Wiley & Sons** A guide to the theory and recent development in the medical use of antenna technology Antenna and Sensor Technologies in Modern Medical Applications offers a comprehensive review of the theoretical background, design, and the latest developments in the application of antenna technology. Written by two experts in the field, the book presents the most recent research in the burgeoning field of wireless medical telemetry and sensing that covers both wearable and implantable antenna and sensor technologies. The authors review the integrated devices that include various types of sensors wired within a wearable garment that can be paired with external devices. The text covers important developments in sensor-integrated clothing that are synonymous with athletic apparel with built-in electronics. Information on implantable devices is also covered. The book explores technologies that utilize both inductive coupling and far field propagation. These include minimally invasive microwave ablation antennas, wireless targeted drug delivery, and much more. This important book: Covers recent developments in wireless medical telemetry Reviews the theory and design of in vitro/in vivo testing Explores emerging technologies in 2D and 3D printing of antenna/sensor fabrication Includes a chapter with an annotated list of the most comprehensive and important references in the field Written for students of engineering and antenna and sensor engineers, Antenna and Sensor Technologies in Modern Medical Applications is an essential guide to understanding human body interaction with antennas and sensors.

## ANTENNAS AND WAVE PROPAGATION

**PHI Learning Pvt. Ltd.** This book, now in its Second Edition, is primarily intended for the undergraduate and postgraduate students of electronics and communication, electronics and electrical and telecommunication engineering. It provides a thorough understanding of the fundamentals and applications of the subject. The edition discusses the properties of several types of antennas such as dipoles, loop, Yagi-Uda, log-periodic, slot/DRA and microstrip antennas and also explains the phenomenon of wave propagation with emphasis on theory of operation and design procedures. It provides a comprehension of the principles of radiation and methods of excitation. The book also focuses on antenna measurements along with necessary requirements and different methods of measurement. Written in an easy-to-understand manner, the text includes several illustrative examples. A large number of solved examples and exercise problems with varying difficulty levels are included to reinforce the theoretical understanding of concepts. The book also contains several objective-type questions in each chapter along with a Question Bank at the end of the book. The Appendices provide a rich source

of information and expressions as well as design data. NEW TO THE SECOND EDITION Separate new chapters are devoted to: • Reflector Antennas • Slot and Dielectric Resonator Antennas • Modern Antennas • Effect of Ground on Antenna Performances

## Antenna Theory and Design

**John Wiley & Sons** Stutzman's 3rd edition of *Antenna Theory and Design* provides a more pedagogical approach with a greater emphasis on computational methods. New features include additional modern material to make the text more exciting and relevant to practicing engineers; new chapters on systems, low-profile elements and base station antennas; organizational changes to improve understanding; more details to selected important topics such as microstrip antennas and arrays; and expanded measurements topic.

## Next-Generation Antennas

### Advances and Challenges

**John Wiley & Sons** Antenna design and wireless communication has recently witnessed their fastest growth period ever in history, and these trends are likely to continue for the foreseeable future. Due to recent advances in industrial applications as well as antenna, wireless communication, and 5G technology, we are witnessing a variety of developing and expanding new technologies. Compact and low-cost antennas are increasing the demand for ultra-wide bandwidth in next-generation (5G) wireless communication systems and the Internet of Things (IoT). Enabling the next generation of high-frequency communication, various methods have been introduced to achieve reliable high data rate communication links and enhance the directivity of planar antennas. 5G technology can be used in many applications, such as in smart city applications and in smartphones. This technology can satisfy the fast rise in user and traffic capacity in mobile broadband communications. Therefore, different planar antennas with intelligent beamforming capability play an important role in these areas. The purpose of this book is to present the advanced technology, developments, and challenges in antennas for next-generation antenna communication systems. This book covers advances in next-generation antenna design and application domain in all related areas. It is a detailed overview of cutting-edge developments and other emerging topics and their applications in all areas of engineering that have achieved great accuracy and performance with the help of the advancement and challenges in next generation antennas. Whether a refresher for veteran engineers hoping to stay abreast of the latest advances and developing concepts in the field, an introduction to new engineers moving into the field, or a textbook for students and faculty, this groundbreaking new volume is a must-have for any library.

## Ultra-Wideband Antennas and Propagation

### For Communications, Radar and Imaging

**John Wiley & Sons** Providing up-to-date material for UWB antennas and propagation as used in a wide variety of applications, "Ultra-wideband Antennas and Propagation for Communications, Radar and Imaging" includes fundamental theory, practical design information and extensive discussion of UWB applications from biomedical imaging, through to radar and wireless communications. An in-depth treatment of ultra-wideband signals in practical environments is given, including interference, coexistence and diversity considerations. The text includes antennas and propagation in biological media in addition to more conventional environments. The topics covered are approached with the aim of helping practising engineers to view the subject from a different angle, and to consider items as variables that were treated as constants in narrowband and wideband systems. Features tables of propagation data, photographs of antenna systems and graphs of results (e.g. radiation patterns, propagation characteristics) Covers the fundamentals of antennas and propagation, as well as offering an in-depth treatment of antenna elements and arrays for UWB systems, and UWB propagation models Provides a description of the underlying concepts for the design of antennas and arrays for conventional as well as ultra-wideband systems Draws together UWB theory by using case-studies to show applications of antennas and propagation in communication, radar and imaging systems The book highlights the unique design issues of using ultra-wideband and will serve both as an introductory text and a reference guide for designers and students alike.

## PBG based Terahertz Antenna for Aerospace Applications

**Springer** This book focuses on high-gain antennas in the terahertz spectrum and their optimization. The terahertz spectrum is an unallocated EM spectrum, which is being explored for a number of applications, especially to meet increasing demands of high data rates for wireless space communications. Space communication systems using the terahertz spectrum can resolve the problems of limited bandwidth of present wireless communications without radio-frequency interference. This book describes design of such high-gain antennas and their performance enhancement using photonic band gap (PBG) substrates. Further, optimization of antenna models using evolutionary algorithm based computational engine has been included. The optimized high-performance compact antenna may be used for various wireless applications, such as inter-orbital communications and on-vehicle satellite communications.

## Antenna Arrays and Automotive Applications

**Springer Science & Business Media** This book throws a lifeline to designers wading through mounds of antenna array patents looking for the most suitable systems for their projects. Drastically reducing the research time required to locate solutions to the latest challenges in automotive communications, it sorts and systematizes material on cutting-edge antenna arrays that feature multi-element communication systems with enormous potential for the automotive industry. These new systems promise to make driving safer and more efficient, opening up myriad applications, including vehicle-to-vehicle traffic that prevents collisions, automatic toll collection, vehicle location and fine-tuning for cruise control systems. This book's exhaustive coverage begins with currently deployed systems, frequency ranges and key parameters. It proceeds to examine system geometry, analog and digital beam steering technology (including "smart" beams formed in noisy environments), maximizing signal-to-noise ratios, miniaturization, and base station technology that facilitates in-car connectivity while on the move. An essential guide for technicians working in a fast-developing field, this new volume will be warmly welcomed as a powerful aid in their endeavors.

## Millimetre Wave Antennas for Gigabit Wireless Communications

### A Practical Guide to Design and Analysis in a System Context

**John Wiley & Sons** Complete and comprehensive application-focused reference on millimetre wave antennas Millimetre Wave Antennas for Gigabit Wireless Communications covers a vast wealth of material with a strong focus on the current design and analysis principles of millimetre wave antennas for wireless devices. It provides practising engineers with the design rules and considerations required in designing antennas for the terminal. The authors include coverage of new configurations with advanced angular and frequency filtering characteristics, new design and analysis techniques, and methods for filter miniaturization. The book reviews up-to-date research results and utilizes numerous design examples to emphasize computer analysis and synthesis whilst also discussing the applications of commercially available software. Key Features: Advanced and up-to-date treatment of one of the fastest growing fields of wireless communications Covers topics such as Gigabit wireless communications and its required antennas, passive and active antenna design and analysis techniques, multibeam antennas and MIMO, IEEE 802.15.3c, WiMedia®, and advanced materials and technologies Offers a practical guide to integrated antennas for specific configurations requirements Addresses a number of complex, real-world problems that system and antenna engineers are going to face in millimetre-wave communications industry and provides solutions Contains detailed design examples, drawings and predicted performance This book is an invaluable tool for antenna professionals (engineers, designers, and developers), microwave professionals, wireless communication system professionals, and industries with microwave and millimetre wave research projects. Advanced students and researchers working in the field of millimetre wave engineering will also find this book very useful.

## Modern Printed-Circuit Antennas

**BoD - Books on Demand** This book presents in-depth information on a variety of the latest developments in modern printed-circuit antennas written by several prominent authors in the field. This book consists of nine chapters covering a wide range of recent research topics. The topics covered include low-profile metamaterial-based adaptive beamforming techniques, high performance meta-surface antennas, fractal antennas, reconfigurable antennas for 5G systems operating at 60 GHz, radiation pattern synthesis of planar arrays using parasitic patches fed by a small number of active elements, decoupled and de-scattered monopole MIMO antenna arrays with orthogonal radiation patterns, ultra-wide band antennas with defected ground plane and microstrip line fed for Wi-Fi/Wi-Max/DCS/5G/satellite communications, and design, fabrication, and characterization of wearable textile antennas with high body-antenna isolation.

## Smart Antennas: Recent Trends in Design and Applications

**Bentham Science Publishers** *This reference provides the reader with focused information about microstrip antenna design and applications. Readers are first introduced to the basic design of microstrip antennas. Subsequent chapters explain how microstrip antennas are suitable for practical applications. These chapters cover topics such as fractal and defected ground structure antennas, microstrip antenna evaluation, and the use of microstrip antennas in mobile communications and IoT applications. Scholars, researchers, and industrial professionals involved in the fields of electronics and electrical engineering as well as instrumentation will benefit from the information given in this book.*

## Conformal Array Antenna Theory and Design

**John Wiley & Sons** *This is the first comprehensive treatment of conformal antenna arrays from an engineering perspective. While providing a thorough foundation in theory, the authors of this publication provide a wealth of hands-on instruction for practical analysis and design of conformal antenna arrays. Thus, you get the knowledge you need, alongside the practical know-how to design antennas that are integrated into such structures aircrafts or skyscrapers.*

## Modern Antenna Handbook

**John Wiley & Sons** *The most up-to-date, comprehensive treatment of classical and modern antennas and their related technologies Modern Antenna Handbook represents the most current and complete thinking in the field of antennas. The handbook is edited by one of the most recognizable, prominent, and prolific authors, educators, and researchers on antennas and electromagnetics. Each chapter is authored by one or more leading international experts and includes cover-age of current and future antenna-related technology. The information is of a practical nature and is intended to be useful for researchers as well as practicing engineers. From the fundamental parameters of antennas to antennas for mobile wireless communications and medical applications, Modern Antenna Handbook covers everything professional engineers, consultants, researchers, and students need to know about the recent developments and the future direction of this fast-paced field. In addition to antenna topics, the handbook also covers modern technologies such as metamaterials, microelectromechanical systems (MEMS), frequency selective surfaces (FSS), and radar cross sections (RCS) and their applications to antennas, while five chapters are devoted to advanced numerical/computational methods targeted primarily for the analysis and design of antennas.*

## Low-cost Smart Antennas

**John Wiley & Sons** *An authoritative guide to the latest developments for the design of low-cost smart antennas Traditional smart antenna systems are costly, consume great amounts of power and are bulky size. Low-cost Smart Antennas offers a guide to designing smart antenna systems that are low cost, low power, and compact in size and can be applied to satellite communications, radar and mobile communications. The authors — noted experts on the topic — provide introductions to the fundamental concepts of antennas, array antennas and smart antennas. The book fills a gap in the literature by presenting the design techniques of low-cost radio frequency (RF) smart antennas as well as approaches for implementing the hardware of the antenna and the beamforming network (BFN). A comprehensive and accessible book, Low-cost Smart Antennas not only presents an up-to-date review of the topic but includes illustrative case studies that contain in-depth explorations of the theory and technology of smart antennas. While other resources highlight the software (signal processing algorithms), this book is unique by focusing on the antenna hardware. This important book: Offers an introduction to the most recent developments of the design of low-cost smart antennas and their applications Presents a unique book that puts the focus on antenna hardware Includes a variety of case studies that clearly demonstrate the implementation of current design techniques Introduces both fundamental theories as well as more advanced topics Written for students and researchers and antenna engineers, Low-cost Smart Antennas explores the most recent advances in the field with an emphasis on antenna hardware.*

## Wearable and Neuronic Antennas for Medical and Wireless Applications

**John Wiley & Sons** *WEARABLE AND NEURONIC ANTENNAS FOR MEDICAL AND WIRELESS APPLICATIONS This new volume in this exciting new series, written and edited by a group of international experts in the field, covers the latest advances and challenges in wearable and neuronic antennas for medical and wireless applications. Antenna development and engineering is changing at a rapid pace, and it is incredibly important that engineers, scientists, and students in the field have a valuable reference work to consult. Students are able to use this book as a learning tool, and professors and industrial short courses are able to use it as a textbook. Covering all of the advances and developments of wearable and neuronic antennas for medical and wireless applications, this outstanding new volume offers*

information not available anywhere else in any other format. Covering new research and development of antenna designs never seen before, this volume, written and edited by a team of experts in the field, breaks new ground, offering new solutions to engineering and scientific problems to experts in the field, while providing the full theoretical and conceptual background for the practical applications. Whether for the veteran engineer or scientist, the student, or a manager or other technician working in the field, this volume is a must-have for any library.

## Advances in Imaging and Electron Physics

### Silicon-Based Millimetre-wave Technology

**Academic Press** *Advances in Imaging and Electron Physics* merges two long-running serials--*Advances in Electronics and Electron Physics* and *Advances in Optical and Electron Microscopy*. This series features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains. Contributions from leading authorities informs and updates on all the latest developments in the field

## Higher Symmetries and Its Application in Microwave Technology, Antennas and Metamaterials

**MDPI** Artificial materials have been widely studied and used in photonics and microwaves in the last few decades. Recent research has proven that the introduction of specific higher symmetries in each cell of a periodic medium is an effective approach to obtain unprecedented exotic behaviors and to overcome the current limitations of these devices. For example, simple symmetries of a purely spatial type (glide or twist transformations) can have a huge impact on the properties of the resulting materials, thus defining wideband behaviors for flat lenses or large stop bands for novel EBG materials. This Special Issue opens with a novel discussion on the effect of time-reversal symmetries in antenna theory and presents new structures exploiting symmetries for antenna and microwave components, such as flat lenses, helix antennas, and gap-waveguides. Finally, new modeling methods are discussed for the study of wave propagation along glide surfaces and twist lines.

## Printed Antennas for Wireless Communications

**John Wiley & Sons** Printed antennas, also known as microstrip antennas, have a variety of beneficial properties including mechanical durability, conformability, compactness and cheap manufacturing costs. As such, they have a range of applications in both the military and commercial sectors, and are often mounted on the exterior of aircraft and spacecraft as well as incorporated into mobile radio communication devices. *Printed Antennas for Wireless Communications* offers a practical guide to state-of-the-art printed antenna technology used for wireless systems. Contributions from renowned global experts within both academia and industry enable the reader to design printed antennas and associated technologies, and offer valuable insights into important breakthroughs in these areas. Divided into 3 sections covering fundamental wideband printed radiating elements for wireless systems, small printed antennas for wireless systems, and advanced concepts and applications in wireless systems. Provides experimental data and applies theoretical models to present design performance trends and to give the reader an in-depth coverage of the area. Presents summaries of different approaches used in solving wireless systems such as WPAN (wireless personal area network) and MIMO (multi-input/ multi-output), offering the reader an overall perspective of the pros and cons of each. Focuses on practical design, examples and 'real world' solutions. *Printed Antennas for Wireless Communications* offers an excellent insight on printed antennas from the theoretical to the practical; hence it will appeal to practicing design engineers within commercial and governmental/ military organisations, as well as postgraduate students and researchers in communications technology

## Capacity Enhancement by Pattern-Reconfigurable Multiple Antenna Systems in

# Vehicular Applications

**KIT Scientific Publishing**

## Antenna Arrays and Beam-formation

**BoD - Books on Demand** Spatial processing and smart antenna beam formation are considered as completely essential approaches to be employed for forthcoming progress in the standards and implementation of the wireless communication systems. The book aims, besides introducing up-to-date contributions that are not readily available in the related literature, to present and demonstrate the recent research ideas in the field of antenna array design and beam-forming algorithms in a synthetic, coherent, and unified manner for the interested researchers. The presented topics range from relatively straightforward mathematical analysis and derivations to simulation and empirical results. The book is designed to serve as an informative reference for the researcher involved in the analysis of the spatial signal processing techniques for smart antenna systems. The book will help the readers, in particular wireless communication researchers, to have wider futuristic and innovative visions for the advances in the field.

## Terahertz Antenna Technology for Space Applications

**Springer** This book explores the terahertz antenna technology towards implementation of compact, consistent and cheap terahertz sources, as well as the high sensitivity terahertz detectors. The terahertz EM band provides a transition between the electronic and the photonic regions thus adopting important characteristics from these regimes. These characteristics, along with the progress in semiconductor technology, have enabled researchers to exploit hitherto unexplored domains including satellite communication, bio-medical imaging, and security systems. The advances in new materials and nanostructures such as graphene will be helpful in miniaturization of antenna technology while simultaneously maintaining the desired output levels. Terahertz antenna characterization of bandwidth, impedance, polarization, etc. has not yet been methodically structured and it continues to be a major research challenge. This book addresses these issues besides including the advances of terahertz technology in space applications worldwide, along with possibilities of using this technology in deep space networks.

## Space Antenna Handbook

**John Wiley & Sons** This book addresses a broad range of topics on antennas for space applications. First, it introduces the fundamental methodologies of space antenna design, modelling and analysis as well as the state-of-the-art and anticipated future technological developments. Each of the topics discussed are specialized and contextualized to the space sector. Furthermore, case studies are also provided to demonstrate the design and implementation of antennas in actual applications. Second, the authors present a detailed review of antenna designs for some popular applications such as satellite communications, space-borne synthetic aperture radar (SAR), Global Navigation Satellite Systems (GNSS) receivers, science instruments, radio astronomy, small satellites, and deep-space applications. Finally it presents the reader with a comprehensive path from space antenna development basics to specific individual applications. **Key Features:** Presents a detailed review of antenna designs for applications such as satellite communications, space-borne SAR, GNSS receivers, science instruments, small satellites, radio astronomy, deep-space applications. Addresses the space antenna development from different angles, including electromagnetic, thermal and mechanical design strategies required for space qualification. Includes numerous case studies to demonstrate how to design and implement antennas in practical scenarios. Offers both an introduction for students in the field and an in-depth reference for antenna engineers who develop space antennas. This book serves as an excellent reference for researchers, professionals and graduate students in the fields of antennas and propagation, electromagnetics, RF/microwave/millimetrewave systems, satellite communications, radars, satellite remote sensing, satellite navigation and spacecraft system engineering. It also aids engineers technical managers and professionals working on antenna and RF designs. Marketing and business people in satellites, wireless, and electronics area who want to acquire a basic understanding of the technology will also find this book of interest.

## Modern Antenna Systems

**BoD - Books on Demand** 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 antennas and techniques targeted for applications in medical, defense, health care, communication, etc. The motivation of this project is to present cutting-edge research materials in the field of antennas for modern wireless communication.

# Handbook of Smart Antennas for RFID Systems

**John Wiley & Sons** *The Handbook of Smart Antennas for RFID Systems is a single comprehensive reference on the smart antenna technologies applied to RFID. This book will provide a timely reference book for researchers and students in the areas of both smart antennas and RFID technologies. It is the first book to combine two of the most important wireless technologies together in one book. The handbook will feature chapters by leading experts in both academia and industry offering an in-depth description of terminologies and concepts related to smart antennas in various RFID systems applications. Some topics are: adaptive beamforming for RFID smart antennas, multiuser interference suppression in RFID tag reading, phased array antennas for RFID applications, smart antennas in wireless systems and market analysis and case studies of RFID smart antennas. This handbook will cover the latest achievements in the designs and applications for smart antennas for RFID as well as the basic concepts, terms, protocols, systems architectures and case studies in smart antennas for RFID readers and tags.*