

Antennas 4th Edition By J D Kraus

This exciting new book focuses on the analysis and design of reconfigurable antennas for modern wireless communications, sensing, and radar. It presents the definitions of basic antenna parameters, an overview of RF switches and explains how to characterize their insertion loss, isolation, and power handling issues. Basic reconfigurable antenna building blocks, such as dipoles, monopoles, patches and slots are described, followed by presentations on frequency reconfigurable antennas, pattern reconfigurable antennas, and basic scanning antenna arrays. Switch biasing in an electromagnetic environment is discussed, as well as simulation strategies of reconfigurable antennas, and MIMO (Multiple Input Multiple Output) reconfigurable antennas. Performance characterization of reconfigurable antennas is also presented. The book provides information for the technical professional to design frequency reconfigurable, pattern reconfigurable, and MIMO antennas all relevant for modern wireless communication systems. Readers learn how to select switching devices, bias them properly, and understand their role in the overall reconfigurable antenna design. The book presents practical experimental implementation issues, including losses due to switches, materials, and EMI (Electromagnetic Interference) and shows how to address those.

The rapid development of technology based on metamaterials coupled with the recent introduction of the transformation optics technique provides an unprecedented ability for device designers to manipulate and control the behavior of electromagnetic wave phenomena. Many of the early metamaterial designs, such as negative index materials and electromagnetic bandgap surfaces, were limited to operation only over a very narrow bandwidth. However, recent groundbreaking work reported by several international research groups on the development of broadband metamaterials has opened up the doors to an exciting frontier in the creation of new devices for applications ranging from radio frequencies to visible wavelengths. This book contains a collection of eight chapters that cover recent cutting-edge contributions to the theoretical, numerical, and experimental aspects of broadband metamaterials. Antennas are used across a wide range of frequencies in the electromagnetic spectrum to concentrate wave energy into electronic circuits. The principles that govern the operation of conventional radio-frequency antennas can be extended to much higher frequencies and be applied to produce nano-metallic (i.e. plasmonic) antennas that act as "receivers" and "transmitters" for visible light. These traits make

them excellent candidates for light trapping in solar cells, light concentration in sub-wavelength photodetectors, or even localized heating for cancer therapies. The unique optical properties of metals at visible frequencies make it difficult to apply traditional antenna design rules. Using full-field electromagnetic simulations and analytical antenna models, we developed new design rules for producing optical antennas with a desired set of optical properties. We then applied these design rules to create antennas that resonantly enhance absorption on thin silicon detectors as well as enhance emission of cathodoluminescence (CL). Through spatial and spectral mapping of both photocurrent and CL we clearly show the fundamental and higher-order resonant modes of these antennas. With CL we are also able to map the spatial distribution of these resonant modes with nanometer resolution. In addition to these specific demonstrated applications, the results of this work enable optical engineers to more easily design a myriad of plasmonic devices that employ optical antenna structures, including nanoscale photodetectors, light sources, sensors, and modulators.

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 II focuses on feed sources. Reflector antennas are extraordinary devices that combine high gain with geometrical simplicity, and can operate in broad frequency bands. Their performance, however, depends on the electrical characteristics of the feed system with which they operate. This comprehensive volume provides you with a solid understanding of feed system theory, design, and analysis. Featuring chapters authored by experts in each aspect of feed systems, this book takes you from fundamental mathematical techniques, electrically small and large dual reflectors, feed geometry and telemetry, tracking and command antennas, and more. Throughout the book numerous examples are provided to guide you in the practical aspects of feed design.

Microwave and Millimeter-wave Remote Sensing for Security Applications

Nano Dielectric Resonator Antennas for 5G Applications

From Theory to Design, Fabrication and Testing

Multifunctional MIMO Antennas: Fundamentals and Application

Antenna Engineering Handbook

This title provides a current, comprehensive overview of the design and analysis of radomes. The second edition includes a wealth of new material, including three new chapters on radome measurement techniques, environmental effects on radomes, and new radome technology. This unique book helps you to design radomes for top performance, understand the effect a radome has on a particular antenna OCOs operation, and become knowledgeable about how to specify acceptable radome equipment. Over 130 illustrations and more than 250 equations support key topics throughout the book."

Written by one of the world's leading experts in the field, this book is intended as an advanced text for courses in antennas, with a focus on the mature but vital background field of aperture antennas. It is aimed at final year, MSc, PhD and post-doctoral students, as well as readers who are moving from academia into industry, beginning careers as wireless engineers, system designers, in R&D, or for practising engineers. It assumes the reader has undertaken an earlier course of study on Maxwell's equations, fields and waves. Some of these topics are summarized in the early few chapters in order to provide continuity and background for the remaining chapters. The aperture antennas covered include the main types of horns, reflectors and arrays as well as microstrip patches, reflectarrays and lenses. To provide more than a superficial treatment of arrays, the topic of mutual coupling is covered in greater detail compared to most similar books in this area. Also included is an introduction to arrays on non-planar surfaces, which are important in applications that involve curved surfaces such as in aerodynamics or for making aperture antennas unobtrusive. A chapter is included on some modern aperture antennas to illustrate design techniques beyond the most common types of aperture antennas described in the early chapters. This is to show where advances have recently been made and where they could be improved in the future. Also included are selective topics that are practical in nature for aperture antennas, namely fabrication and measurement.

Techniques based on the method of modal expansions, the Rayleigh-Stevenson expansion in inverse powers of the wavelength, and also the method of moments solution of integral equations are essentially restricted to the analysis of electromagnetic radiating structures which are small in terms of the wavelength. It therefore becomes necessary to employ approximations based on "high-frequency techniques" for performing an efficient analysis of electromagnetic radiating systems that are large in terms of the wavelength. One of the most versatile and useful high-frequency techniques is the geometrical theory of diffraction (GTD), which was developed around 1951 by J. B. Keller [1,2,3]. A class of diffracted rays are introduced systematically in the GTD via a generalization of the concepts of classical geometrical optics (GO). According to the GTD these diffracted rays exist in addition to the usual incident, reflected, and transmitted rays of GO. The diffracted rays in the GTD originate from certain "localized" regions on the surface of a radiating structure, such as at discontinuities in the

geometrical and electrical properties of a surface, and at points of grazing incidence on a smooth convex surface as illustrated in Fig. 1. In particular, the diffracted rays can enter into the GO shadow as well as the lit regions. Consequently, the diffracted rays entirely account for the fields in the shadow region where the GO rays cannot exist.

The gold-standard reference on the design and application of classic and modern antennas—fully updated to reflect the latest advances and technologies This new edition of the “bible of antenna engineering” has been updated to provide start-to-finish coverage of the latest innovations in antenna design and application. You will find in-depth discussion of antennas used in modern communication systems, mobile and personal wireless technologies, satellites, radar deployments, flexible electronics, and other emerging technologies, including 5G, terahertz, and wearable electronics. Antenna Engineering Handbook, Fifth Edition, is bolstered by real-world examples, hundreds of illustrations, and an emphasis on the practical aspects of antennas. Featuring 60 chapters and contributions from more than 80 renowned experts, this acclaimed resource is edited by one of the world’s leading antenna authorities. This edition features all of the classic antenna types, plus new and emerging designs, with 13 all-new chapters and important updates to nearly all chapters from past editions. Antenna Engineering Handbook, Fifth Edition, clearly explains cutting-edge applications in WLANs, automotive systems, PDAs, and handheld devices, making it an indispensable companion for today’s antenna practitioners and developers. Coverage includes:

- Antenna basics and classic antennas*
- Design approaches for antennas and arrays*
- Wideband and multiband antennas*
- Antennas for mobile devices and PDAs, automotive applications, and aircraft*
- Base station and smart antennas*
- Beamforming and 5G antennas*
- Millimeter-wave and terahertz antennas*
- Flexible, wearable, thin film, origami, dielectric, and on-chip antennas*
- MIMO antennas and phased arrays*
- Direction-finding and GPS antennas*
- Active antennas*
- Low-profile wideband antennas*
- Nanoantennas*
- Reflectors and other satellite and radio-telescope antennas*
- Low-frequency, HF, VHF, UHF, ECM, and ESM antennas*
- Impedance-matching techniques and material characteristics*
- Metastructured and frequency selective surfaces*
- Propagation and guided structures*
- Computational techniques and toolsets*
- Indoor and outdoor measurements*

Fundamentals and Applications

Practical Antenna Handbook 5/e

Bioengineering and Biophysical Aspects of Electromagnetic Fields, Fourth Edition

Plasmonic Optical Antennas for Enhanced Light Detection and Emission

UHF RFID Technologies for Identification and Traceability

We are always surrounded by electromagnetic waves and fields of various spectra. This book explains basic electromagnetic

theory with the help of design formulations i.e. mathematical background on antennas along with experimentations, which has made this book unique. The main purpose of this book is to embed mathematical EM theory of dielectric resonator antennas with experimental validation so that understanding of concepts takes place. Initially, basic understanding of philosophy of dielectric resonators has been discussed, then it is supported with mathematical modeling and later same is implemented with its prototype model along with experimentations. The modes theory gives important analysis on currents distribution, impedance analysis and radiation pattern in DRA. Circular polarization can built signal robustness, case studies on circular polarization has been included. Equivalent RLC circuit concept has been introduced. Challenges of switching from microwave to terahertz has been briefly discussed. Nano DRA will revolutionize the wireless technology. Nano DRA ,Terahertz DRA and Quantum DRA have analyzed and studied.

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.

ANTENNA AND EM MODELING WITH MATLAB ANTENNA TOOLBOX™ An essential text to MATLAB Antenna Toolbox™ as accessible and easy-to-use full-wave antenna modeling tool Antenna and EM Modeling with MATLAB Antenna Toolbox™ is a textbook on antennas intended for a one semester course. The core philosophy is to introduce the key antenna concepts and follow them up with full-wave modeling and optimization in the MATLAB Antenna Toolbox™. Such an approach will enable immediate testing of theoretical concepts by experimenting in software. It also provides the direct path to research work. The fundamental families of antennas — dipoles, loops, patches, and traveling wave antennas — are discussed in detail, together with the respective antenna arrays. Using antenna parameters such as impedance, reflection coefficient, efficiency, directivity, and gain, the reader is introduced to the different ways of understanding the performance of an antenna. Written for senior undergraduates, graduates as well as RF/Antenna engineers, Antenna and EM Modeling with Antenna Toolbox™ is a resource that: Provides 14 video assisted laboratories on using Antenna Toolbox™ Includes approximately 50 real-world examples in antenna and array design Offers approximately 200 homework problems Provides multiple ready-to-use standalone MATLAB® scripts

This is an exciting revision of John Kraus' classic book Antennas, which has been long known as the "Antenna Bible". A new co-author, Ronald Marhefka has joined the author team for this revision. Many new, modern applications have been added-thus the title change to Antennas with All Applications. As well, the references have been updated to include recent additions to the literature. Additionally, the book has been reorganized to make it more user-friendly for both students and professionals. The book now covers the fundamentals of various antennas and concepts in the first half of the book and then gets into more details on those same topics later in the book. This allows a one-semester course to just cover the fundamentals if desired, and

a professional to focus on advanced topics if he or she wants.

For All Applications

Theory and Design

Chipless RFID Reader Architecture

Antenna and EM Modeling with MATLAB Antenna Toolbox

Antenna Handbook

Practical ultrawideband phased array technology used in airborne and ground-based systems applications. Ultrawideband phased array antennas are an enabling technology for many ground-based and airborne communications and radar systems. This book surveys electromagnetic theory and phased array antenna theory and provides examples of ultrawideband phased array antenna technology. It describes some of the research on ultrawideband phased arrays undertaken by the authors and their colleagues at MIT Lincoln Laboratory over the last ten years. The book focuses on experimental prototype ultrawideband phased array technology developed at Lincoln Laboratory for applications in the VHF and UHF bands from approximately 100 MHz to 1 GHz, and addresses dipole, monopole, loop, and other antenna array elements. It offers examples of antennas for both airborne and ground vehicle applications. Most of the examples are developed in the context of rapid prototyping for quick assessment of communications and radar systems feasibility, with measurements and numerical electromagnetic simulation results provided for many prototype examples. The book is intended primarily for practicing antenna engineers, radar engineers, and communications engineers, and for graduate students and researchers in electrical engineering. Readers need no prior knowledge of ultrawideband antennas, although some background in electromagnetic theory, antennas, radar, and communications would be helpful.

This book focuses on performance enhancement of printed antennas using frequency selective surfaces (FSS) technology. The growing demand of stealth technology in strategic areas requires high-performance low-RCS (radar cross section) antennas. Such requirements may be accomplished by incorporating FSS into the antenna structure either in its ground plane or as the superstrate, due to the filter characteristics of FSS structure. In view of this, a novel approach based on FSS technology is presented in this book to enhance the performance of printed antennas including out-of-band structural RCS reduction. In this endeavor, the EM design of microstrip patch antennas (MPA) loaded with FSS-

based (i) high impedance surface (HIS) ground plane, and (ii) the superstrates are discussed in detail. The EM analysis of proposed FSS-based antenna structures have been carried out using transmission line analogy, in combination with the reciprocity theorem. Further, various types of novel FSS structures are considered in designing the HIS ground plane and superstrate for enhancing the MPA bandwidth and directivity. The EM design and performance analyses of FSS-based antennas are explained here with the appropriate expressions and illustrations.

The book is primarily designed to cater to the needs of undergraduate and postgraduate students of Electronics and Communication Engineering and allied branches. It also caters for fundamental requirements of professionals working on design and development of antenna and wave propagation related equipment either in research laboratories or industries or academic institutions elsewhere. The book has been written with intent to grasp the basic understanding of theoretical as well as practical aspects of electromagnetic wave propagation and antenna engineering. The text has been aptly scripted considering the requirements of average students who can easily grasp and comprehend the basics of wave propagation and radiation mechanism of varieties of antennas coupled with their critical functionalities, utilities, advantages/disadvantages without any external assistance of teachers or other reference books. The book broaches very well on practical methods of parametric measurements of antenna with right measuring test equipment and associated tools. The last chapter of the book is dedicated to advance technology adopted in design and development of modern antenna. Key features • A fairly large number of well labelled diagrams to provide practical understanding of the concepts. • The placement of numericals at appropriate places develops confidence among readers and entuses them further to read in depth to crack any regular or competitive examinations. • Chapter summary highlights important points for quick recap and revision before examination. • Well-crafted multiple choice questions with answers at the end of each chapter to stimulate thought process and prepare better for viva-voce and competitive examinations. • Appropriate number of unsolved numerical problems with answers to improve problem solving skill of students.

THE DEFINITIVE ANTENNA REFERENCE--FULLY REVISED AND EXPANDED! Design and build your own antennas with the help of this unique guide. Updated and revised to provide clear answers to questions frequently asked by hobbyists and electronics technicians, Practical Antenna Handbook, Fifth Edition blends theoretical concepts with hands-on experience--requiring only high school mathematics

Reorganized to flow logically from broad physical principles to specific antenna design and construction techniques, the book begins by covering the fundamentals. Then the half-wave dipole is discussed both as an excellent antenna in its own right and as a conceptual tool for predicting the performance of other designs. Transmission line impedance matching techniques--and a companion Smith chart tutorial--lead into "must have" accessories for tuning, monitoring, and troubleshooting antenna system performance. Other tools, such as antenna modeling software and network analyzer add-ons for PCs and Macs, are addressed, and concluding chapters offer fresh insights into support structures and installation techniques. NEW TOPICS COVERED INCLUDE: Characteristics of all-driven and parasitic arrays Beverages and small MF/HF receiving loops Top-loaded shunt-fed towers and other verticals Theory and design of Yagi beams Effect of real ground on propagation and antenna patterns, impedance, and efficiency Lightning protection and four kinds of ground systems Zoning and restrictive covenants COVERS A WIDE VARIETY OF ANTENNAS: Dipoles and inverted-Vs Quads, delta, and NVIS loops Wire arrays (bobtail curtain, half-square, rhombic) Verticals and shunt-fed towers Rotatable Yagi beams MF/HF receiving antennas (flag, pennant, K9AY, Beverage) Mobile and portable antennas VHF/UHF/microwave antennas And many more GO TO WWW.MHPROFESSIONAL.COM/CARR5 FOR: * Tables of worldwide geographic coordinates and antenna dimensions vs. frequency * Supplier updates * Author's blog * Additional photographs and schematics * Links to tutorials and specialized calculators

Analysis and Design

Handbook of Smart Antennas for RFID Systems

Analysis of Radome-enclosed Antennas

Automotive Antenna Design and Applications

Next-Generation Antennas

Now in an completely revised, updated, and enlarged Second Edition, *Small Antennas in Portable Devices* reviews recent significant theoretical and practical developments in the electrically small antenna area. Examining antenna designs that work as well as those that have limitations, this new edition provides practicing engineers and upper level and graduate students with new information on: work on improving bandwidth using spherical helix dipoles; work on electromagnetically coupled structures; exact derivation of the Q for electrically small antennas for both the TE and TM modes; and a new simplified Q formula.

Microstrip patch antennas have become the favorite of antenna designers because of their versatility and having the

advantages of planar profile, ease of fabrication, compatibility with integrated circuit technology, and conformability with a shaped surface. There is a need for graduate students and practicing engineers to gain an in depth understanding of this subject. The first edition of this book, published in 2011, was written with this purpose in mind. This second edition contains approximately one third new materials. The authors, Prof KF Lee, Prof KM Luk and Dr HW Lai, have all made significant contributions in the field. Prof Lee and Prof Luk are IEEE Fellows. Prof Lee was the recipient of the 2009 John Kraus Antenna Award of the IEEE Antennas and Propagation Society while Prof. Luk receives the same award in 2017, both in recognition of their contributions to wideband microstrip antennas.

The steady evolution of wireless communication technologies continues to pave the way for the implementation of innovative services and devices in modern vehicles. These include analog and digital audio broadcasting radio, satellite radio, GPS, cell phones, and short range communication devices. Such applications require the use multiple antennas operating in different frequency ranges. Automotive Antenna Design and Applications thoroughly examines traditional and new advanced automotive antennas, including the principles, designs, and techniques used to reduce antenna dimensions without significant degradation of communication quality. The contents of this book are based on cutting-edge data collected from numerous technical papers, patents, and patent applications. It presents an overview of many commercially available automotive antennas and covers features that have become standard in automotive applications, such as printed-on car glass antennas, reduced-size helical antennas, multiband compact, printed-on dielectric and patch designs in a single package. Includes simulation examples of antenna parameters that significantly speed up the design process using software packages such as FEKO, NEC, IE3D, and Genesys Highlighting the practical aspects of antenna design, the authors present passive and active designs and describe the entire design process, including antenna simulation, prototype sample fabrication, and laboratory test measurements. The book also covers the production adjustments that can result from the demands of the real car environment. The presentation of numerous examples of passive and active automotive antennas greatly enhances this reference's value to professionals, students, and anyone else working in the ever-evolving field of antenna design and application.

The Latest Resource for the Study of Antenna Theory! In a discipline that has experienced vast technological changes, this text offers the most recent look at all the necessary topics. Highlights include: * New coverage of microstrip antennas provides information essential to a wide variety of practical designs of rectangular and circular patches, including computer programs. * Applications of Fourier transform (spectral) method to antenna radiation. * Updated material on moment methods, radar cross section, mutual impedances, aperture and horn antennas, compact range designs, and antenna measurements. A New Emphasis on Design! Balanis features a tremendous increase in design procedures and equations. This presents a solid solution to the challenge of meeting real-life situations faced by engineers. Computer programs contained in the book-and accompanying software-have been developed to help engineers analyze, design, and visualize the radiation

characteristics of antennas.

Antennas and Wave Propagation: Fourth Edition

Antenna Theory

Modern Lens Antennas for Communications Engineering

Antennas

This book addresses computationally-efficient multi-objective optimization of antenna structures using variable-fidelity electromagnetic simulations, surrogate modeling techniques, and design space reduction methods. Based on contemporary research, it formulates multi-objective design tasks, highlights related challenges in the context of antenna design, and discusses solution approaches. Specific focus is on providing methodologies for handling computationally expensive simulation models of antenna structures in the sense of their multi-objective optimization. Also given is a summary of recent developments in antenna design optimization using variable-fidelity simulation models.

Numerous examples of real-world antenna design problems are provided along with discussions and recommendations for the readers interested in applying the considered methods in their design work. Written with researchers and students in mind, topics covered can also be applied across a broad spectrum of aeronautical, mechanical, electrical, biomedical and civil engineering. It is of particular interest to those dealing with optimization, computationally expensive design tasks and simulation-driven design.

UHF Radio Frequency Identification (RFID) is an electronic tagging technology that allows an object, place or person to be automatically identified at a distance without a direct line-of-sight using a radio wave exchange. Applications include inventory tracking, prescription medication tracking and authentication, secure automobile keys, and access control for secure facilities. This book begins with an overview of UHF RFID challenges describing the applications, markets, trades and basic technologies. It follows this by highlighting the main features distinguishing UHF (860MHz-960MHz) and HF (125 kHz and 13.56 MHz) identifications, in terms of reading range, environmental sensitivity, throughput and safety. The architecture of the integrated circuits and the organization of the memory are then described. One chapter is devoted to the air interface protocol aspects, including coding, modulation, multi readers operation and anti-collision algorithms to manage the tag responses. Focus will be put upon the EPC Gen2 protocol adopted in the ISO 18000 Part 6. The core of the book will cover the design and manufacturing issues of RFID tags. The influence of the propagation medium (warehouse, libraries, etc.), the tag close environment (bottles, liners, containers, carton boxes, etc.) and the coupling between tags will also be carefully addressed. The final chapter is dedicated to an industrial use case in the supply chain management, either in the retail inventory or blood traceability.

Antennas and Wave Propagation: Fourth Edition Tata McGraw-Hill Education Antenna Theory Analysis and Design Wiley

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.

Current Status and Future Trends

Antenna Theory and Design

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

Polarization in Electromagnetic Systems, Second Edition

RCS Synthesis for Chipless RFID

Ultra wideband (UWB) has advanced and merged as a technology, and many more people are aware of the potential for this exciting technology. The current UWB field is changing rapidly with new techniques and ideas where several issues are involved in developing the systems. Among UWB system design, the UWB RF transceiver and UWB antenna are the key components. Recently, a considerable amount of researches has been devoted to the development of the UWB RF transceiver and antenna for its enabling high data transmission rates and low power consumption. Our book attempts to present current and emerging trends in-research and development of UWB systems as well as future expectations.

The aim of this book is to present the modern design principles and analysis of lens antennas. It gives graduates and RF/Microwave professionals the design insights in order to make full use of lens antennas. Why do we want to write a book in lens antennas? Because this topic has not been thoroughly publicized, its importance is underestimated. As antennas play a key role in communication systems, recent development in wireless communications would indeed benefit from the characteristics of lens antennas: low profile, and low cost etc. The major advantages of lens antennas are narrow beamwidth, high gain, low sidelobes and low noise temperature. Their structures can be more compact and weigh less than horn antennas and parabolic antennas. Lens antennas with their quasi-optical characteristics, also have low loss, particularly at near millimeter and submillimeter wavelengths where they have particular advantages. This book systematically conducts advanced and up-to-date treatment of lens antennas.

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.

The two volumes of this new edition of the Handbook cover the basic biological, medical, physical, and electrical engineering principles. They also include experimental results concerning how electric and magnetic fields affect biological systems—both as potential hazards to health and potential tools for medical treatment and scientific research. They also include material on the relationship between the science and the regulatory processes concerning human exposure to the fields. Like its predecessors, this edition is intended to be useful as a reference book but also for introducing the reader to bioelectromagnetics or some of its aspects.

FEATURES • New topics include coverage of electromagnetic effects in the terahertz region, effects on plants, and explicitly applying feedback concepts to the analysis of biological electromagnetic effects • Expanded coverage of electromagnetic brain stimulation, characterization and modeling of epithelial wounds, and recent lab experiments on at all frequencies • Section on background for setting standards and precautionary principle • Discussion of recent epidemiological, laboratory, and theoretical results; including: WHO IARC syntheses of epidemiological results on both high and low frequency fields, IITRI lab study of cancer in mice exposed to cell phone-like radiation, and other RF studies • All chapters updated by internationally acknowledged experts in the field

Microstrip Antennas

Frequency Selective Surfaces based High Performance Microstrip Antenna

Microstrip Patch Antennas (Second Edition)

Ultra Wideband

Reconfigurable Antenna Design and Analysis

In the era of information communication technology (ICT), radio frequency identification (RFID) has been going through tremendous development. RFID technology has the potential of replacing barcodes due to its large information carrying capacity, flexibility in operations, and applications. The deployment of RFID has been hindered by its cost. However, with the advent of low powered ICs, energy scavenging techniques, and low-cost chipless tags, RFID technology has achieved significant development. This book addresses the new reader architecture, presents fundamentals of chipless RFID systems, and covers protocols. It also presents proof-of-concept implementations with potential to replace trillions of barcodes per year. Overall, this resource aims to not only explain the technology, but to make the chipless RFID reader system a viable commercial product for mass deployment. It is certainly a very useful resource in the new field.

Microwave and millimeter-wave remote sensing techniques are fast becoming a necessity in many aspects of security as detection and classification of objects or intruders becomes more difficult. This groundbreaking resource offers you expert guidance in this burgeoning area. It provides you with a thorough treatment of the principles of microwave and millimeter-wave remote sensing for security applications, as well as practical coverage of the design of radiometer, radar, and imaging systems. You learn how to design active and passive sensors for intruder detection, concealed object detection, and human

activity classification. This detailed book presents the fundamental concepts practitioners need to understand, including electromagnetic wave propagation in free space and in media, antenna theory, and the principles of receiver design. You find in-depth discussions on the interactions of electromagnetic waves with human tissues, the atmosphere and various building and clothing materials. This timely volume explores recently developed detection techniques, such as micro-Doppler radar signatures and correlation radiometry. The book is supported with over 200 illustrations and 1,135 equations. This one-of-a-kind new resource presents cognitive radio from an antenna design perspective and introduces the concept of cognitive radio as a protocol that benefits from under-utilized regions of the spectrum. This book covers topics that govern the operation of a cognitive radio and discusses the use of reconfigurable antennas, reconfigurable filter antennas, and MIMO antennas for cognitive radio. The analysis and design of different antenna systems are presented, compared and evaluated. New approaches to improve spectrum efficiency are explored by demonstrating how to design software controlled cognitive radio antenna systems. This new resource shows how to communicate using either interweave or underlay cognitive radio and demonstrates the benefits of designing appropriate sensing and communicating antennas. The first part of the book introduces the basic concept of cognitive radio and discusses the difference between cognitive radio and software defined radio from the RF system's perspective. The second part of the book discusses the main antenna design requirements, procedures and challenges for cognitive radio. The third part of the book introduces new trends in cognitive radio implementation such as the implementation of MIMO antennas on cognitive radio, the use of machine learning techniques to optimize the performance of a cognitive radio environment, and the implementation of cognitive radar and cognitive radio in space.

This book presents a comprehensive approach to antenna designs for various applications, including 5G communication, the internet of things (IoT), and wearable devices. It discusses models, designs, and developments of MIMO antennas, antenna performance measurement, 5G communication challenges and opportunities, and MIMO antennas for LTE/ISM applications. It covers important topics including mmWave antennas, antenna arrays for MIMO applications, reconfigurable/band-notched MIMO antennas, multiband MIMO antennas, wideband MIMO antennas, and fractal-based compact multiband hybrid antennas. FEATURES Discusses antenna design optimization techniques in detail Covers MIMO antenna performance measurement, multiband MIMO antennas, and wideband MIMO antennas Discusses modeling, simulation, and specific absorption rate (SAR) analysis of antennas Provides applications including radio-frequency identification (RFID), wearable antennas, and antennas for IoT Multifunctional MIMO Antennas: Fundamentals and Application is useful for undergraduate and graduate students and academic researchers in areas including electrical engineering, electronics, and communication engineering.

Small Antenna Handbook

Simulation-Driven Design Optimization and Modeling for Microwave Engineering

Ultrawideband Phased Array Antenna Technology for Sensing and Communications Systems

Handbook of Reflector Antennas and Feed Systems Volume II: Feed Systems

Antenna Design for Cognitive Radio

This completely revised and expanded edition of an Artech House classic Polarization in Electromagnetic Systems presents the principles of polarization as applied to electromagnetic systems. This edition emphasizes the concepts needed for functional aspects of systems calculations and device evaluation. Readers find up-to-date coverage of applications in wireless communications. The fundamentals of polarization are explained, including the principles of wave polarization along with their mathematical representations. This book explores polarized, partially polarized waves, and unpolarized waves. The second part of the book addresses applications of polarization to practical systems. Antenna polarization is covered in detail, including omnidirectional, directional, and broadband antennas with emphasis on antennas for generating linear and circular polarization for each antenna type. This book provides detailed coverage of wave interaction with an antenna and dual-polarized systems. Additional topics covered in this edition include propagation through depolarizing media, polarization in wireless communication systems, including polarization diversity and polarization measurements. This hands-on resource provides a clear exposition on the understanding of polarization principles and evaluation of the performance of electromagnetic systems. This book serves as an easily accessible reference for wireless digital communication systems. Topics are presented with simple but non-trivial examples and then elaborated with their variations and sophistications. It includes numerous examples and exercises to illustrate key points. The book emphasizes both practical problem solving and a thorough understanding of fundamentals, aiming to realize the complementary relationship between practice and theory. Though the author emphasize wireless radio channels, the fundamentals that are covered are useful to different channels - digital subscriber line, coax, power lines, optical fibers, and even Gigabit serial interconnection. This book is the outgrowth of the author's hands-on experience in the telecommunication systems industry as a research and development engineer. It is written primarily for practitioners of wireless digital communication systems – engineers and technical leaders and managers – and for digital communication systems in general including new comers like graduate students and upper-division undergraduate students. The material in chapters 5(OFDM), 6(Channel coding), 7(Synchronization) and 8(Transceivers) contains something new, not explicitly available in typical textbooks, and useful in practice. For example, in Chapter 5, all known orthogonal frequency division multiplex signals are formulated based on pulse shape and thus flexible, e.g., unlike currently predominant symbol block transmission, it can be serial transmission. In Chapter 6, we emphasize practical applications of powerful error coding such as LDPC to higher order modulations, fading, and non-linearity problem. In Chapter 7, new digital timing detectors are suggested for small access bandwidth shaping pulse, and a digital quadrature imbalance correction is also included along with digital carrier phase recovery. In Chapter 8, low IF digital image cancelling transceiver is treated in detail so that practical implementation can be readily done with advantages.

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.

The considerable growth of RFID is currently accompanied by the development of numerous identification technologies that complement those already available while seeking to answer new problems. Chipless RFID is one example. The goal is to both significantly reduce the price of the tag and increase the amount of information it contains, in order to compete with the barcode while retaining the benefits of a flexible reading approach based on radio communication. To solve the problem of the number of bits, this book describes the possibility of coding the information at the level of the overall shape of the RCS of the tag, which would facilitate reaching very large quantities. The design of the tags then returns to the resolution of the inverse problem of the electromagnetic signature. The proposed design methodology regularizes the problem by decomposing the signature on a basis of elementary patterns whose signature is chosen in advance. Includes a theoretical presentation of scattering phenomenon in electromagnetism, regrouping elements from classical RFID, pulse radar, and antenna theory Features a new coding technique based on magnitude level that is presented and characterized for different kinds of tags Proposes, for the first time, RCS synthesis based on a physical approach for wide-frequency bands

A Guide to the Wireless Engineering Body of Knowledge (WEBOK)

Theory, Applications, and Design

Electromagnetics and Antenna Technology

Broadband Metamaterials in Electromagnetics

Fundamentals of Aperture Antennas and Arrays

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.

Written by a leading expert in the field, this practical new resource presents the fundamentals of electromagnetics and antenna technology. This book covers the design, electromagnetic simulation, fabrication, and measurements for various types of antennas, including impedance matching techniques and beamforming for ultrawideband dipoles, monopoles, loops, vector sensors for direction finding, HF curtain arrays, 3D printed nonplanar patch antenna arrays, waveguides for portable radar, reflector antennas, and other antennas. It explores the essentials of phased array antennas and includes detailed derivations of important field equations, and a detailed formulation of the method of moments. This resource exhibits essential derivations of equations, providing readers with a strong foundation of the underpinnings of electromagnetics and antennas. It includes a complete chapter on the details of antenna and electromagnetic test and measurement. This book explores details on 3D printed non-planar circular patch array antenna technology and the design and analysis of a planar array-fed axisymmetric gregorian reflector. The lumped-element impedance matched antennas are examined and include a look at an analytic impedance matching solution with a

parallel LC network. This book provides key insight into many aspects of antenna technology that have broad applications in radar and communications.

Computer-aided full-wave electromagnetic (EM) analysis has been used in microwave engineering for the past decade. Initially, its main application area was design verification. Today, EM-simulation-driven optimization and design closure become increasingly important due to the complexity of microwave structures and increasing demands for accuracy. In many situations, theoretical models of microwave structures can only be used to yield the initial designs that need to be further fine-tuned to meet given performance requirements. In addition, EM-based design is a must for a growing number of microwave devices such as ultra-wideband (UWB) antennas, dielectric resonator antennas and substrate-integrated circuits. For circuits like these, no design-ready theoretical models are available, so design improvement can only be obtained through geometry adjustments based on repetitive, time-consuming simulations. On the other hand, various interactions between microwave devices and their environment, such as feeding structures and housing, must be taken into account, and this is only possible through full-wave EM analysis. Electromagnetic simulations can be highly accurate, but they tend to be computationally expensive. Therefore, practical design optimization methods have to be computationally efficient, so that the number of CPU-intensive high-fidelity EM simulations is reduced as much as possible during the design process. For the same reasons, techniques for creating fast yet accurate models of microwave structures become crucially important. In this edited book, the authors strive to review the state-of-the-art simulation-driven microwave design optimization and modeling. A group of international experts specialized in various aspects of microwave computer-aided design summarize and review a wide range of the latest developments and real-world applications. Topics include conventional and surrogate-based design optimization techniques, methods exploiting adjoint sensitivity, simulation-based tuning, space mapping, and several modeling methodologies, such as artificial neural networks and kriging. Applications and case studies include microwave filters, antennas, substrate integrated structures and various active components and circuits. The book also contains a few introductory chapters highlighting the fundamentals of optimization and modeling, gradient-based and derivative-free algorithms, metaheuristics, and surrogate-based optimization techniques, as well as finite difference and finite element methods.

Contents: Introduction to Optimization and Gradient-Based Methods (Xin-She Yang and Slawomir Koziel) Derivative-Free Methods and Metaheuristics (Xin-She Yang and Slawomir Koziel) Surrogate-Based Optimization (Slawomir Koziel, Leifur Leifsson, and Xin-She Yang) Space Mapping (Slawomir Koziel, Stanislav Ogurtsov, Qingsha S Cheng, and John W Bandler) Tuning Space Mapping (Qingsha S Cheng, John W Bandler, and Slawomir Koziel) Robust Design Using Knowledge-Based Response Correction and Adaptive Design Specifications (Slawomir Koziel, Stanislav Ogurtsov, and Leifur Leifsson) Simulation-Driven Design of Broadband Antennas Using Surrogate-Based Optimization (Slawomir Koziel and Stanislav Ogurtsov) Neural Networks for Radio Frequency/Microwave Modeling (Chuan Zhang, Lei Zhang, and Qi-Jun

Zhang) Parametric Modeling of Microwave Passive Components Using Combined Neural Network and Transfer Function (Yazi Cao, Venu-Madhav-Reddy Gongal-Reddy, and Qi-Jun Zhang) Parametric Sensitivity Macromodels for Gradient-Based Optimization (Krishnan Chemmangat, Francesco Ferranti, Tom Dhaene, and Luc Knockaert) Neural Space Mapping Methods for Electromagnetics-Based Yield Estimation (José E Rayas-Sánchez) Neural Network Inverse Modeling for Microwave Filter Design (Humayun Kabir, Ying Wang, Ming Yu, and Qi-Jun Zhang) Simulation-Driven Design of Microwave Filters for Space Applications (Elena Díaz Caballero, José Vicente Morro Ros, Héctor Esteban González, Vicente Enrique Bôria Esbert, Carmen Bachiller Martín, and Ángel Belenguer Martínez) Time Domain Adjoint Sensitivities: The Transmission Line Modeling (TLM) Case (Mohamed H Bakr and Osman S Ahmed) Boundary Conditions for Two-Dimensional Finite-Element Modeling of Microwave Devices (Tian-Hong Loh and Christos Mias) Boundary Conditions for Three-Dimensional Finite-Element Modeling of Microwave Devices (Tian-Hong Loh and Christos Mias) Readership: Graduates, lecturers, and researchers in electrical engineering, as well as engineers who use numerical optimization in their design work. This book will be of great interest to researchers in the fields of microwave engineering, antenna design, and computational electromagnetics. Keywords: Computer-Aided Design; Electromagnetic Simulation; Microwave Design; Numerical Optimization; Surrogate Modeling Key Features: This book summarizes the latest developments in the field. It provides a balanced coverage of classical and engineering-oriented optimization methods in one volume, and also includes methodologies not covered by any other book elsewhere, such as robust modeling methodologies (both conventional and modern) and physically-based approaches; surrogate-based techniques and microwave-engineering specific approaches simulation-driven design methods for computationally expensive problems. This book covers both introductory materials, practical methods and algorithms, as well as applications and case studies

Technology and Applications

Modern Digital Radio Communication Signals and Systems

WAVE PROPAGATION AND ANTENNA ENGINEERING

Multi-objective Design Of Antennas Using Surrogate Models

Advances and Challenges