

Ultra-wideband Phased Array Antenna Technology For Sensing And Communications Systems Mit Lincoln Laboratory Series

Ultra-wideband (UWB) phased antenna arrays are critical to the success of future multi-functional communication, sensing, and countermeasure systems, which will utilize a few UWB phased arrays in place of multiple antennas on a platform. The success of this new systems approach relies in part on the ability to manufacture and assemble low-cost UWB phased arrays with excellent radiation characteristics. This dissertation presents the theory and design of a new class of UWB Arrays that is based on unbalanced fed tightly-coupled horizontal dipoles over a ground plane. Practical implementation of this concept leads to two inexpensive wideband array topologies, the Banyan Tree Antenna (BTA) Array, and the Planar Ultra-wideband Modular Antenna (PUMA) Array. The key challenge in designing unbalanced-fed tightly-coupled dipole arrays lies in the control of a common mode resonance that destroys UWB performance. This work introduces a novel feeding strategy that eliminates this resonance and results in wideband, wide-angle radiation. More importantly, the new feeding scheme is simple and intuitive, and can be implemented at low-cost in both vertically and planarly-integrated phased array architectures. Another desirable byproduct of this topology is the electrical and mechanical modularity of the aperture, which enables easy manufacturability and assembly. A theoretical framework is presented for the new phased array topologies, which is then applied to the design of finite BTA and PUMA Arrays that achieve 4:1 and 5:1 bandwidths, respectively. A practical application of this technology is demonstrated through the full design, fabrication, and measurement of a 7.25-21GHz 16x16 dual-pole PUMA array prototype for SATCOM applications.

This completely revised third edition of an Artech House classic, Phased Array Antenna Handbook, Second Edition, offers an up-to-date and comprehensive treatment of array antennas and systems. This edition provides a wealth of new material, including expanded coverage of phased array and multiple beam antennas. New modern machine learning techniques used for analysis are included. Additional material on wideband antennas and wideband coverage in array antennas are incorporated in this book, including new methods, devices, and technologies that have developed since the second edition. A detailed treatment of antenna system noise, sections on antenna pattern synthesis, developments in subarray technology, and in-depth coverage of array architecture and components are additional new features of this book. The book explores design elements that demonstrate how to size an array system with speed and confidence. Moreover, this resource provides expanded coverage of systems aspects of arrays for radar and communications. Supported with numerous equations and illustrations, this practical book helps evaluate basic antenna parameters such as gain, sidelobe levels, and noise. Readers learn how to compute antenna system noise, design

subarray geometries for given bandwidth, scan angle, sidelobe constraints, and choose array illumination tapers for given sidelobe level. Detailed descriptions of detection, direction-finding, and signal-estimation methods, using consistent formalisms and notation, emphasizing HF antenna array sensing applications. Adaptive antenna array technology encompasses many powerful interference suppression approaches that exploit spatial differences among signals reaching a radio receiver system. Today, worldwide propagation phenomenology occurring in the High Frequency (HF) radio regime has made such interference common. In this book, Jay Sklar, a longtime researcher at MIT Lincoln Laboratory, presents detailed descriptions of detection, direction-finding, and signal-estimation methods applicable at HF, using consistent formalisms and notation. Modern electronic system technology has made many of these techniques affordable and practical: the goal of the book is to offer practicing engineers a comprehensive and self-contained reference that will encourage more widespread application of these approaches. The book is based on the author's thirty years of managing MIT Lincoln Laboratory work on the application of adaptive antenna array technologies to the sensing of HF communication signals. After an overview of HF propagation phenomenology, communication signal formats, and HF receiver architectural approaches, Sklar describes the HF propagation environment in more detail, introduces important modulation approaches and signaling protocols used at HF, discusses HF receiver system architectural features; and addresses signal processor architecture and its implementation. He then presents the technical foundation for the book: the vector model for a signal received at an adaptive array antenna. He follows this with discussions of actual signal processing techniques for detection and direction finding, including specific direction-finding algorithms; geolocation techniques; and signal estimation.

Ultra-wideband (UWB) short-pulse (SP) electromagnetics are now being used for an increasingly wide variety of applications, including collision avoidance radar, concealed object detection, and communications. Notable progress in UWB and SP technologies has been achieved by investigations of their theoretical bases and improvements in solid-state manufacturing, computers, and digitizers. UWB radar systems are also being used for mine clearing, oil pipeline inspections, archeology, geology, and electronic effects testing. Ultra-wideband Short-Pulse Electromagnetics 3 presents selected papers of deep technical content and high scientific quality from the UWB-SP Conference, which was held from July 21-25, 2008, in Lausanne, Switzerland. The wide-ranging coverage includes contributions on electromagnetic theory, time-domain computational techniques, modeling techniques, antennas, pulsed-power, UWB interactions, radar systems, UWB communications, broadband systems and components. This book serves as a state-of-the-art reference for scientists and engineers working in these applications areas.

Wireless Technologies

Ultra-wideband Radar

Ultra Wideband Antennas

Ultra-wideband Short-Pulse Radio Systems

Proceedings of SoCTA 2016, Volume 2

Decision Making Under Uncertainty

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 and thermal performance • Provides a reference 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.

By 1990 the wireless revolution had begun. In late 2008, Mike Golio gave the world a significant tool to use in this revolution: The RF and Microwave Handbook. Since then, wireless technology spread across the globe with unprecedented speed, fueled by 3G and 4G mobile technology and the proliferation of wireless LANs. Updated to reflect this tremendous growth, the second edition of this widely embraced, bestselling handbook divides its coverage conveniently into a set of three books, each focused on a particular aspect of the technology. Six new chapters cover WiMAX, broadband cable, bit error ratio (BER) testing, high-power PAs (power amplifiers), heterojunction bipolar transistors (HBTs), as well as an overview of microwave engineering. Over 100 contributors, with diverse backgrounds in academic, industrial, government, manufacturing, design, and research reflect the breadth and depth of the field. This eclectic mix of contributors ensures that the coverage balances fundamental technical issues with the important business and marketing constraints that define commercial RF and microwave engineering. Focused chapters filled with formulas, charts, graphs, diagrams, and tables make the information easy to locate and apply to practical cases. The new format, three tightly focused volumes, provides not only increased information but also ease of use. You can find the information you need quickly, without wading through material you don't immediately need, giving you access to the caliber of data you have come to expect in a much more user-friendly format.

Advanced concepts for wireless technologies present a vision of technology that is embedded in our surroundings and practically invisible. From established radio techniques like GSM, 802.11 or Bluetooth to more emerging technologies, such as Ultra Wide Band and smart dust notes, a common denominator for future progress is the underlying integrated circuit technology. Wireless Technologies responds to the explosive growth of standard cellular radios and radically different wireless applications by presenting new architectural and circuit solutions engineers can use to solve their wireless problems. This reference addresses state-of-the-art CMOS design in the context of emerging wireless applications, including 3G/4G cellular telephony, wireless sensor networks, and wireless medical application. Written by top international experts specializing in both the IC industry and academia, this carefully edited work uncovers new design opportunities in body area networks, medical implants, satellite communications, automobile radar detection, and wearable electronics. The book is divided into three sections: wireless system perspectives, chip architecture and implementation issues, and devices and technologies used to fabricate wireless integrated circuits. Contributors address key issues in the development of future silicon-based systems, such as scale of integration, ultra-low power dissipation, and the integration of heterogeneous circuit design style and processes onto one substrate. Wireless sensor network systems are now being applied in critical applications in commerce, healthcare, and security. This reference, which contains 25 practical and scientifically rigorous articles, provides the knowledge communications engineers need to design innovative methodologies at the circuit and system level.

An introduction to decision making under uncertainty from a computational perspective, covering both theory and applications ranging from speech recognition to airborne collision avoidance. Many important problems involve decision making under uncertainty—that is, choosing actions based on often imperfect observations, with unknown outcomes. Designers of automated decision support systems must take into account the various sources of uncertainty while balancing the multiple objectives of the system. This book provides an introduction to the challenges of decision making under uncertainty from a computational perspective. It presents both the theory behind decision making models and algorithms and a collection of example applications that range from speech recognition to aircraft collision avoidance. Focusing on two methods for designing decision agents, planning and reinforcement learning, the book covers probabilistic models, introducing Bayesian networks as a graphical model that captures probabilistic relationships between variables; utility theory as a framework for understanding optimal decision making under uncertainty; Markov decision processes as a method for modeling sequential problems; model uncertainty; state uncertainty; and cooperative decision making involving multiple interacting agents. A series of applications shows how the theoretical concepts can be applied to systems for attribute-based person search, speech recognition, collision avoidance, and unmanned aircraft persistent surveillance. Decision Making Under Uncertainty unifies research from different communities using consistent notation, and is accessible to students and researchers across engineering disciplines who have some prior exposure to probability theory and calculus. It can be used as a text for advanced undergraduate and graduate students in fields including computer science, aerospace and electrical engineering, and management science. It will also be a valuable professional reference for researchers in a variety of disciplines.

Internet of Things – ICIOT 2019

Soft Computing: Theories and Applications

Ultra-wideband Antennas for Microwave Imaging Systems

Low-profile, Modular, Ultra-wideband Phased Arrays

An Examination of the Government's Spectrum Management Process : Hearing Before the Subcommittee on Telecommunications and the Internet of the Committee on Energy and Commerce, House of Representatives, One Hundred Seventh Congress, Second Session, June 5, 2002

Communication, Navigation and Reconnaissance

The first book to present the common mathematical foundations of big data analysis across a range of applications and technologies. Today, the volume, velocity, and variety of data are increasing rapidly across a range of fields, including Internet search, healthcare, finance, social media, wireless devices, and cybersecurity. Indeed, these data are growing at a rate beyond our capacity to analyze them. The tools—including spreadsheets, databases, matrices, and graphs—developed to address this challenge all reflect the need to store and operate on data as whole sets rather than as individual elements. This book presents the common mathematical foundations of these data sets that apply across many applications and technologies. Associative arrays unify and simplify data, allowing readers to look past the differences among the various tools and leverage their mathematical similarities in order to solve the hardest big data challenges. The book first introduces the concept of the associative array in practical terms, presents the associative array manipulation system DAW (Dynamic Distributed Dimensional Data Model), and describes the application of associative arrays to graph analysis and machine learning. It provides a mathematically rigorous definition of associative arrays and describes the properties of associative arrays that arise from this definition. Finally, the book shows how concepts of linearity can be extended to encompass associative arrays. Mathematics of Big Data can be used as a textbook or reference by engineers, scientists, mathematicians, computer scientists, and software engineers who analyze big data.

This book helps to solve the problems and challenges of satellite sensing in the current environment of increasing communications bandwidths and multiplicity of electromagnetic signals. It presents technology that makes full use of the broadband low-loss advantages of optoelectronic technology and research into new broadband radio-frequency channelization and receiving technology based on photoelectric sensing. The methods presented allow improvements in system performance in terms of receiving bandwidth, frequency-sensing accuracy, channel equalization, adjacent channel crosstalk, dynamic range, and complexity of the system structure. In addressing the difficulty of satellite spectrum control, including the issue of high-precision and real-time wide-spectrum sensing not being able to be obtained simultaneously, the book solves the problem of accurate and parallel-decomposition sensing technology using the dual-phase optical frequency comb. This method avoids the involvement of fine filtering and does not require fine alignment between the source and the filter but achieves high perceptual accuracy. Satellite Photoelectric Sensing Technology explores the research background, significance, and current challenges associated with the technology, making it relevant and interesting to academics, practitioners, and postgraduate students in this field.

Ultra Wideband Antennas: Design, Methodologies, and Performance presents the current state of the art of ultra wideband (UWB) antennas, from theory specific for these radiators to guidelines for the design of omnidirectional and directional UWB antennas. Offering a comprehensive overview of the latest UWB antenna research and development, this book: Discusses the developed theory for UWB antennas in frequency and time domains Delivers a brief exposition of numerical methods for electromagnetics oriented to antennas Describes solid-planar equivalence, which allows flat structures to be implemented instead of volumetric antennas Examines the impedance matching, phase linearity, and radiation patterns as design objectives for omnidirectional and directional antennas Addresses the time domain signal analysis for UWB antennas, from which the distortion phenomenon can be modeled Includes illustrative examples, design equations, CST MICROWAVE STUDIO® simulations, and MATLAB® plot generations Compares the performance of different UWB antennas, supplying useful insight into particular tendencies and unresolved problems Ultra Wideband Antennas: Design, Methodologies, and Performance provides a valuable reference for the scientific community, as UWB antennas have a variety of applications in body area networks, radar, imaging, spectrum monitoring, electronic warfare, wireless sensor networks, and more.

This book explores both the state-of-the-art and the latest achievements in UWB antennas and propagation. It has taken a theoretical and experimental approach to some extent, which is more useful to the reader. The book highlights the unique design issues which put the reader in good pace to be able to understand more advanced research.

Handbook of Smart Antennas for RFID Systems

Satellite Photoelectric Sensing Technology

Ultra Wideband Communications

Theory and Application

Design, Methodologies, and Performance

The RF and Microwave Handbook - 3 Volume Set

This book discusses the development of promising technologies for compact antennas for high data-rate communications. It discusses and analyzes the design of compact ultra-wideband (UWB) and multiple input, multiple output (MIMO) antennas, providing essential know-how for designers, practicing engineers and scientists. These wireless communication technologies enable consumers to have convenient access to a wide range of services – anytime, anywhere. And the introduction of wireless mobile access points eliminates the limitations to communication imposed by geographical location. The Internet has allowed people to access and share information much more rapidly, but at the same time, the higher data rates with the limited available resources and imposed constraints, wireless communication technology needs to be pushed beyond the physical limits of the propagation channel. This book contributes to achieving this goal.

In the high frequency world, the passive technologies required to realize RF and microwave functionalities present distinctive challenges. SAW filters, dielectric resonators, MEMS, and waveguide do not have counterparts in the low frequency or digital environment. Even when conventional lumped components can be used in high frequency applications, their behavior does not resemble that observed at lower frequencies. RF and Microwave Passive and Active Technologies provides detailed information about a wide range of component technologies used in modern RF and microwave systems. Updated chapters include new material on such technologies as MEMS, device packaging, surface acoustic wave (SAW) filters, bipolar junction and heterojunction transistors, and high mobility electron transistors (HMETs). The book also features a completely rewritten section on wide bandgap transistors.

This book focuses on soft computing and its applications to solve real-life problems occurring in different domains ranging from medical and health care, supply chain management and image processing to cryptanalysis. It presents the proceedings of International Conference on Soft Computing: Theories and Applications (SoCTA 2016), offering significant insights into soft computing for teachers and researchers and inspiring more and more researchers to work in the field of soft computing. >The term soft computing represents an umbrella term for computational techniques like fuzzy logic, neural networks, and nature inspired algorithms. In the past few decades, there has been an exponential rise in the application of soft computing techniques for solving complex and intricate problems arising in different spheres of life. The versatility of these techniques has made them a favorite among scientists and researchers working in diverse areas. SoCTA is the first international conference being organized at Amity University Rajasthan (AUR), Jaipur. The objective of SoCTA 2016 is to provide a common platform to researchers, academicians, scientists, and industrialists working in the area of soft computing to share and exchange their views and ideas on the theory and application of soft computing techniques in multi-disciplinary areas. The aim of the conference is to bring together young and experienced researchers, academicians, scientists, and industrialists for the exchange of knowledge. SoCTA especially encourages the young researchers at the beginning of their career to participate in this conference and present their work on this platform.

This book presents ultrawideband antennas and their applications on microwave imaging. The chapters focus on recent techniques, analysis, and applications along with the future vision of this emerging field of applied electromagnetics. Several emerging topics are essayed, including dielectric resonator antennas and planar ultrawideband antennas for microwave imaging. This book incorporates most of the design concepts, analysis, and optimization techniques based on recent developments. Readers are also provided with an extensive overview of current regulations, including those related to microwave effects in biological tissues.

Adaptive Antennas and Phased Arrays for Radar and Communications

Compact Antennas for High Data Rate Communication

IMDC-SDSP 2020

4th International Conference, Held as Part of the Services Conference Federation, SCF 2019, San Diego, CA, USA, June 25–30, 2019, Proceedings

Ultra-Wideband Short-Pulse Electromagnetics 8

Spatial Polarization Characteristics of Radar Antenna

This book constitutes the proceedings of the International Conference on Internet of Things, ICIOT 2019, held as part of SCF 2019, in San Diego, CA, USA, in June 2019. The 8 full and 3 short papers presented in this volume were carefully reviewed and selected from 16 submissions. With the rapid advancements of mobile Internet, cloud computing, and big data, the Internet of Things (IoT) is now moving into a new era which is termed as Internet of Things Services (IOTS). In this era, sensors and other types of sensing devices, wired and wireless networks, platforms and tools, data processing/visualization/analysis and integration engines, and other components of traditional IoT are interconnected to connected things, people, and virtual Internet spaces.

This resource provides a comprehensive treatment of the methods, analysis, and practice of impulse and ultra-wideband (UWB) systems. Sources, antennas, propagation, electromagnetic theory, and actual practical systems are explored.This book provides novel perspective on impulse and short-pulse wireless engineering along with practical high-power impulse signals. Theoretical and experimental results in the time-frequency domain are presented. The book explains and discusses the scattering of UWB electromagnetic pulses by conducting and dielectric objects. Impulse responses of objects and propagation channels are explored with details of signal models and their SP Kramers-Kronig type relation for estimating transfer functions. Readers gain insight into the development of high-power sources of UWB radiation with megawatt effective potential on the base of combined antenna arrays excited with bipolar voltage pulses. This in-depth volume includes chapters on receiving antennas, transmitting antenna power UWB radiation sources as well as problem sets.

Microwave Imaging Methods and Applications provides practitioners and researchers with a complete overview of the latest and most important noninvasive and nondestructive techniques for inspecting structures and bodies by using microwaves. Placing emphasis on applications, the book considers many areas, from medical imaging and prospectation. For each application, readers are presented with the objectives of the inspection and related challenges. Moreover, this groundbreaking resource details computational methods that can be used to solve inverse problems related to specific applications, including clear examples or the most significant practical results, this forward development. Practitioners and researchers need to compare imaging methods used in different applications and develop new uses of imaging apparatuses and systems. The development of deep space surveillance technology and its late application to near-Earth surveillance, covering work at Lincoln Laboratory from 1970 to 2000. In the 1950s, the United States and the Soviet Union raced to develop space-based intelligence gathering capability. The Soviets succeeded first, with SPUTNIK 1 in 1957. The US presence by developing technology for the detection and tracking of man-made resident space objects (RSOs) in near-Earth orbit. In 1972, the Soviet Union launched a satellite into deep space orbit, and the U.S. government called on MIT Lincoln Laboratory to develop deep space surveillance technology. This book describes these development surveillance technology to near-Earth surveillance, covering work at Lincoln Laboratory on object surveillance from 1970 to 2000. The contributors, all key participants in developing these technologies, discuss topics that include narrow beam, narrow bandwidth radar for deep surveillance; wide bandwidth radar for RSO monitoring; ground-adaptation for space-based surveillance; radar as the means of real-time search and discovery techniques; methods of analyses of signature data from narrow bandwidth radars; and the collision hazard for satellites in geosynchronous orbit, stemming initially from the failure of TELSTAR 401. They also describe some unintended byproducts of space surveillance techniques for near-Earth asteroid detection. Contributors Rick Abbott, Robert Bergemann, E.M. Gaposchkin, Israel Kupiec, Richard Lambour, Antonio F. Pensa, Eugene Rork, Jayant Sharma, Craig Solodyna, Ramaswamy Sridharan, J. Scott Stuart, George Zollinger

Mathematics of Big Data

RF and Microwave Passive and Active Technologies

Small and Short-Range Radar Systems

Phased Array Antenna Handbook, Third Edition

Circuits and Systems

The FCC's UWB Proceeding

Practical ultra-wideband phased array technology used in airborne and ground-based systems applications.

This comprehensive summary of the state of the art in Ultra Wideband (UWB) system engineering takes you through all aspects of UWB design, from components through the propagation channel to system engineering aspects. Mathematical tools and basics are covered, allowing for a complete characterisation and description of the UWB scenario, in both the time and the frequency domains. UWB MMICs, antennas, antenna arrays, and filters are described, as well as quality measurement parameters and design methods for specific applications. The UWB propagation channel is discussed, including a complete mathematical description together with modeling tools. A system analysis is offered, addressing both radio and radar systems, and techniques for optimization and calibration. Finally, an overview of future applications of UWB technology is presented. Ideal for scientists as well as RF system and component engineers working in short range wireless technologies.

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 UWB antenna 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 practicing engineers to view the subject from a different angle, and to consider items as variables that were treated as constants in narrow-band 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.

IMDC-SDSP conference offers an exceptional platform and opportunity for practitioners, industry experts, technocrats, academics, information scientists, innovators, postgraduate students, and research scholars to share their experiences for the advancement of knowledge and obtain critical feedback on their work. The timing of this conference coincides with the rise of Big Data. Artificial Intelligence powered applications, Cognitive Communications, Green Energy, Adaptive Control and Mobile Robotics towards maintaining the Sustainable Development and Smart Planning and management of the future technologies. It is aimed at the knowledge generated from the integration of the different data sources related to a number of active real-time applications in supporting the smart planning and enhance and sustain a healthy environment. The conference also covers the rise of the digital health, well-being, home care, and patient-centred era for the benefit of patients and healthcare providers; in addition to how supporting the development of a platform of smart Dynamic Health Systems and self-management.

Novel Trends - Antennas and Propagation

Radar Technology

Ultra Wideband

UWB Technology

For Communications, Radar and Imaging

Providing a practical review of the latest technology in the field, Ultra-wideband Radar Applications and Design presents cutting-edge advances in theory, design, and practical applications of ultra-wideband (UWB) radar. This book features contributions from an international team of experts to help readers learn about a wide range of UWB topics, including: History of the technology American and European governmental regulations and key definitions Nonsinusoidal wave propagation theory Random signal radar Object detection by ground permittivity measurements Large-target backscattering effects Medical applications Large current radiator antenna design Materials-penetrating theory Radar signal processing Weak-signal detection methods Holographic and real time radar imaging This book's contributors use practical information to illustrate the latest theoretical developments and demonstrate UWB radar principles through case studies. Radar system engineers will find ideas for precision electronic sensing systems for use in medical, security, industrial, construction, and geophysical applications, as well as those used in archeological, forensic and transportation operations.

Ultra wideband technology is one of the most promising directions in the rapidly developing modern communications. Ultra-wideband communication system applications include radars, wireless personal area networks, sensor networks, imaging systems and high precision positioning systems. Ultra wideband transmission is characterized by high data rate, availability of low-cost transceivers, low transmit power and low interference. The proposed book consisting of 19 chapters presents both the state-of-the-art and the latest achievements in ultra wideband communication system performance, design and components. The book is addressed to engineers and researchers who are interested in the wide range of topics related to ultra wideband communications.

Advances in ubiquitous antenna technology is driven by the continuous demand for Internet of Things (IoT) products. To date, the industry has been addressing these demands by enhancing the signaling strength, speed, operating bandwidth, etc which facilitated different generations of wireless technology (1G, 2G, 3G, 4G, and 5G). Several unintended factors have undermined the benefit from the advances in flexible inkjet printed Antenna of Things (AoT) products. Notably, the challenges associated with these are to maintain constant conductive performance at flexible or reconfigurable conditions. Previous studies emphasized more on the design improvements instead of establishing an ideal printing condition for antenna implementation. This research aims to establish a unique, and cost-effective inkjet printing properties on the photo paper using silver nano ink. This step is followed by the fabrication of an antenna and comparing the response with relatively similar antenna architecture with the rigid FR4 substrate. After printing optimization, and fabrication, the flexible printed pattern was subjected to several repetitive rolling and bending test. The results confirm the robustness of the specimen. Since a single ultra-wideband (UWB) antenna can replace many single narrow-band antennas, a UWB antenna was implemented on photo paper with the optimized printing methods. The antenna operates over 3.2-30 GHz frequency range and compliant with UWB standards. Finally, a new 5G phased array antenna design is proposed in order to keep pace with the future IoT and high-speed 5G communication.

Ultra Wide Band (UWB) technology has attracted increasing interest and there is a growing demand for UWB for several applications and scenarios. The unlicensed use of the UWB spectrum has been regulated by the Federal Communications Commission (FCC) since the early 2000s. The main concern in designing UWB circuits is to consider the assigned bandwidth and the low power permitted for transmission. This makes UWB circuit design a challenging mission in today's community. Various circuit designs and system implementations are published in this book to give the reader a glimpse of the state-of-the-art examples in this field. The book starts at the circuit level design of major UWB elements such as filters, antennas, and amplifiers; and ends with the complete system implementation using such modules.

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Perspectives on Defense Systems Analysis

IEEE International Symposium on Phased Array Systems and Technology

Ultra-Wideband Antennas and Propagation

Antenna-in-Package Technology and Applications

Modern HF Signal Detection and Direction Finding

Radar Expert, Esteemed Author Gregory L. Charvat on CNN and CBSAuthor Gregory L. Charvat appeared on CNN on March 17, 2014 to discuss whether Malaysia Airlines Flight 370 might have literally flown below the radar. He appeared again on CNN on March 20, 2014 to explain the basics of radar, and he explored the hope and limitations of the technology i

Based on the author's extensive research at MIT Lincoln Laboratory, this authoritative resource offers an in-depth description of adaptive array design, emphasizing the RF characteristics, mutual coupling among elements, and field testing methods. It provides you with proven techniques for challenging projects involving radar, communication systems and antenna design. For the first time in any book, you find design guidance on specialized types of arrays, using monopole radiating elements, slotted cylinders and ultrawideband dipoles. Moreover, this unique book presents a focused near-field technique that quantifies the far-field performance of large aperture radar systems and communication systems. The book presents example prototype phased array antennas, including discussions on monopole phased arrays, finite and infinite array analyses, measurements for planar arrays of monopole elements. Further, you get a detailed explanation of how near-field pattern characteristics of monopole arrays as related to adaptive array testing in the near field. From the fundamentals of adaptive antennas and degrees of freedom for multiple beam antennas and phased array's to a test bed monopole phased array and the planar near field testing technique to arrays of horizontally polarized loop-fed slotlet cylinder antennas and ultrawideband dipole arrays, this comprehensive book offers you invaluable, hands-on knowledge for your work in the field.

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 purpose of the Ultra-Wideband Short-Pulse Electromagnetics Conference series is to focus on advanced technologies for the generation, radiation and detection of ultra-wideband short pulse signals, taking into account their propagation and scattering from and coupling to targets of interest. This Conference series reports on developments in supporting mathematical and numerical methods and presents current and potential future applications of the technology. Ultra-Wideband Short-Pulse Electromagnetics 8 is based on the American Electromagnetics 2006 conference held from June 3-7 in Albuquerque, New Mexico. Topics areas covered in this volume include pulse radiation and measurement, scattering theory, target detection and identification, antennas, signal processing, and communications.

Electromagnetics and Antenna Technology

High-performance Antenna Design for IoT, Wearable, and 5G Communications

Ultra-Wideband and 60 GHz Communications for Biomedical Applications

Proceedings of the 1st International Multi-Disciplinary Conference Theme: Sustainable Development and Smart Planning, IMDC-SDSP 2020, Cyberspace, 28-30 June 202

Circuits, Systems, and Devices

Applied State Estimation and Association

A guide to defense systems analysis by experts who have worked on systems that range from air defense to space defense.

A rigorous introduction to the theory and applications of state estimation and association, an important area in aerospace, electronics, and defense industries. Applied state estimation and association is an important area for practicing engineers in aerospace, electronics, and defense industries, used in such tasks as signal processing, tracking, and navigation. This book offers a rigorous introduction to both theory and application of state estimation and association. It takes a unified approach to problem formulation and solution development that helps students and junior engineers build a sound theoretical foundation for their work and develop skills and tools for practical applications. Chapters 1 through 6 focus on solving the problem of estimation with a single sensor observing a single object, and cover such topics as parameter estimation, state estimation for linear and nonlinear systems, and multiple model estimation algorithms. Chapters 7 and 8 extend the discussion to consider multiple sensors and multiple objects. The book can be used in a first-year graduate course in control or system engineering or as a reference for professionals. Each chapter ends with problems that will help readers to develop derivation skills that can be applied to new problems and to build computer models that offer a useful set of tools for problem solving. Readers must be familiar with state-variable representation of systems and basic probability theory including random and stochastic processes.

This book presents novel research ideas and offers insights into radar system design, artificial intelligence and signal processing applications. Further, it proposes a new concept of antenna spatial polarization characteristics (SPC), suggesting that the antenna polarization is a function of the spatial direction and providing new ideas for radar signal processing (RSP) and anti-jamming. It also discusses the design of an advanced signal-processing algorithm, and proposes new polarimetric and anti-jamming methods using antenna inherent properties. The book helps readers discover the potential of radar information processing and improve its anti-interference and target identification ability. It is of interest to university researchers, radar engineers and graduate students in computer science and electronics who wish to learn the core principles, methods, algorithms, and applications of RSP.

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 ground and dipole antennas 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.

Applications and Design

Analysis, Measurement and Anti-jamming Application

Spreadsheets, Databases, Matrices, and Graphs

Ultra-wideband (UWB) and Multiple-Input-Multiple-Output (MIMO) Technology

Microwave Imaging Methods and Applications

Perspectives in Space Surveillance

In this book “Radar Technology”, the chapters are divided into four main topic areas: Topic area 1: “Radar Systems” consists of chapters which treat whole radar systems, environment and target functional chain. Topic area 2: “Radar Applications” shows various applications of radar systems, including meteorological radars, ground penetrating radars and glaciology. Topic

area 3: "Radar Functional Chain and Signal Processing" describes several aspects of the radar signal processing. From parameter extraction, target detection over tracking and classification technologies. Topic area 4: "Radar Subsystems and Components" consists of design technology of radar subsystem components like antenna design or waveform design. This book investigates the design of devices, systems, and circuits for medical applications using the two recently established frequency bands: ultra-wideband (3.1-10.6 GHz) and 60 GHz ISM band. These two bands provide the largest bandwidths available for communication technologies and present many attractive opportunities for medical applications. The applications of these bands in healthcare are wireless body area network (WBAN), medical imaging, biomedical sensing, wearable and implantable devices, fast medical device connectivity, video data transmission, and vital signs monitoring. The recent technological advances and developments proposed or used in medicine based on these two bands are covered. The book introduces possible solutions and design techniques to efficiently implement these systems in medical environment. All individual chapters are written by leading experts in their fields. Contributions by authors are on various applications of ultra-wideband and the 60 GHz ISM band including circuit implementation, UWB and 60 GHz signal transmission around and in-body, antenna design solution, hardware implementation of body sensors, UWB transceiver design, 60 GHz transceiver design, UWB radar for contactless respiratory monitoring, and ultra-wideband based medical imaging. The book will be a key resource for medical professionals, bio-medical engineers, and graduate and senior undergraduate students in computer, electrical, electronic and biomedical engineering disciplines.

Ultra-wideband RF System Engineering
Ultrawideband Phased Array Antenna Technology for Sensing and Communications Systems