

Partially Filled Rectangular Waveguide

Reviews the fundamental concepts behind the theory and computation of electromagnetic fields. The book is divided in two parts. The first part covers both fundamental theories (such as vector analysis, Maxwell's equations, boundary condition, and transmission line theory) and advanced topics (such as wave transformation, addition theorems, and fields in layered media) in order to benefit students at all levels. The second part of the book covers the major computational methods for numerical analysis of electromagnetic fields for engineering applications. These methods include the three fundamental approaches for numerical analysis of electromagnetic fields: the finite difference method (the finite difference time-domain method in particular), the finite element method, and the integral equation-based moment method. The second part also examines fast algorithms for solving integral equations and hybrid techniques that combine different numerical methods to seek more efficient solutions of complicated electromagnetic problems.

Theory and Computation of Electromagnetic Fields, Second Edition: Provides the foundation necessary for graduate students to learn and understand more advanced topics. Discusses electromagnetic analysis in rectangular, cylindrical and spherical coordinates. Covers computational electromagnetics in both frequency and time domains. Includes new and updated homework problems and examples.

Theory and Computation of Electromagnetic Fields, Second Edition is written for advanced undergraduate and graduate level electrical engineering students. This book can also be used as a reference for professional engineers interested in learning about analysis and computation skills.

A new edition of the leading textbook on the finite element method, incorporating major advancements and further applications in the field of electromagnetics. The finite element method (FEM) is a powerful simulation technique used to solve boundary-value problems in a variety of engineering circumstances. It has been widely used for analysis of electromagnetic fields in antennas, radar scattering, RF and microwave engineering, high-speed/high-frequency circuits, wireless communication, electromagnetic compatibility, photonics, remote sensing, biomedical engineering, and space exploration.

The Finite Element Method in Electromagnetics, Third Edition explains the method's processes and techniques in careful, meticulous prose and covers not only essential finite element method theory, but also its latest developments and applications—giving engineers a methodical way to quickly master this very powerful numerical technique for solving practical, often complicated, electromagnetic problems. Featuring over thirty percent new material, the third edition of this essential and comprehensive text now includes: A wider range of applications, including antennas, phased arrays, electric machines, high-frequency circuits, and crystal photonics. The finite element analysis of wave propagation, scattering, and radiation in periodic structures. The time-domain finite element method for analysis of wideband antennas and transient electromagnetic phenomena. Novel domain decomposition techniques for parallel computation and efficient simulation of large-scale problems, such as phased-array antennas and photonic crystals. Along with a great many examples, *The Finite Element Method in Electromagnetics* is an ideal book for engineering students as well as for professionals in the field.

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This authoritative resource provides you with a detailed description of ideal array element characteristics that help you estimate the quality of development of real-world phased array antennas. You find several approaches to optimum phased array design, allowing you to provide specified array gain in a specific region of scan, using a minimum number of expensive, controlled devices. Moreover, this practical book presents important numerical methods that you can use to model and optimize phased array structure to obtain the best array characteristics that the chosen structure can provide. From arrays with beam-forming networks, arrays of coupled dual-mode waveguides, and arrays with reactively loaded radiators, to waveguide arrays with protruding dielectric elements, and arrays with strip, disk, and wire structures, this comprehensive reference explains a wide range of essential topics to help you with work in this challenging area. The book is supported with over 165 illustrations and more than 566 equations.

This second volume of the three-volume complete reference on microwave engineering covers all of the major circuit types used in microwave systems, and also covers antennas and propagation, an area vital to microwave systems. The emphasis is on fundamental principles and practical hardware, providing a wealth of information for engineers and system designers. Annotation copyright by Book News, Inc., Portland, OR

Digest contains the materials on the research and applications of pulsed lasers. Abstracts are interesting for researchers and engineers in the field of quantum electronics, spectroscopy, plasma physics, medicine, remote sensing and laser technologies.

Electromagnetics for Engineering Students is a textbook in two parts, Part I and II, that cover all topics of electromagnetics needed for undergraduate students from vector analysis to antenna principles. In both parts of the book, the topics are presented in sufficient details such that the students will follow the analytical development easily. Each chapter is supported by many illustrative examples, solved problems, and the end of chapter problems to explain the principles of the topics and enhance the knowledge of the student. There are a total of 681 problems in the both parts of the book as follows: 162 illustrative examples, 88 solved problems, and 431 end of chapter problems. This part is a continuation of Part I and focuses on the application of Maxwell's equations and the concepts that are covered in Part I to analyze the characteristics of wave propagation in half-space and bounded media including metamaterials. Moreover, a chapter has been devoted to the topic of antennas to provide readers with the fundamental concepts related to antenna engineering. The key features of this part: • In addition to the coverage of classical topics in electromagnetic normally covered in the similar available texts, this part of the book adds some advanced concepts and topics such as: • Application of multi-pole expansion for vector potentials. • More detailed analysis on the topic of waveguides including circular waveguides. • Refraction through metamaterials and the concept of negative refractive index. • Detailed and easy-to follow presentation of mathematical analyses and problems. • An appendix of mathematical formulae and functions.

This textbook provides a solid foundation into many approaches that are used in the analysis of advanced electromagnetic wave propagation problems. The techniques discussed are essential to obtain closed-form solutions or asymptotic solutions and meet an existing need for

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instructors and students in electromagnetic theory. The book covers various advanced mathematical methods used in the evaluation of the electromagnetic fields in rectangular, cylindrical and spherical geometries. The mathematics of special functions (i.e., Bessel, Hankel, Airy, Legendre, Error, etc.) are covered in depth, including appropriate Appendices. The author takes particular care to provide detailed explanations of auxiliary potentials, Hertz's vectors, Debye potentials, as well as the use of Green functions, the Watson transformation and the method of steepest descent in the solution of electromagnetic problems. Overall, *Advanced Electromagnetic Wave Propagation Methods* is a good source for the many skills required in obtaining closed form and asymptotic solution, which in many instances cannot be obtained using computer codes of Maxwell's equations. Thus, it provides an excellent training for preparing graduate students in their research work. This book is intended for a graduate course in electromagnetic theory for students in electrical engineering. Students in physics and professionals will also find it appropriate and useful.

The problem of determining the scattered electromagnetic fields when a dielectric step discontinuity is placed in a waveguide is considered here. The case of a dielectric step which is semi-infinite in extent is presented first. Although an exact method of solution is not known at this time, it is shown that the recently introduced modified residue calculus technique can be successfully extended to obtain a very accurate approximate solution of the semi-infinite dielectric step. A unique advantage of this method of solution is that the degree of accuracy obtained is independent of the relative permittivity of the dielectric material and of the frequency. Thus, very high permittivities of frequencies can be considered without an attendant increase in computational complexity. Numerical data are presented which confirm the accuracy of the solutions obtained. The accurate determination of the total field is easily accomplished using the method of this study and is demonstrated. A further extension of the modified residue calculus method yields the approximate solution for the case of a finite dielectric step. This extension also enjoys the advantages mentioned above. The phase shifting abilities of the finite step are demonstrated by calculations which show the effects of varying the step height and the step length. (Author).

The *Electrical Engineer's Handbook* is an invaluable reference source for all practicing electrical engineers and students. Encompassing 79 chapters, this book is intended to enlighten and refresh knowledge of the practicing engineer or to help educate engineering students. This text will most likely be the engineer's first choice in looking for a solution; extensive, complete references to other sources are provided throughout. No other book has the breadth and depth of coverage available here. This is a must-have for all practitioners and students! The *Electrical Engineer's Handbook* provides the most up-to-date information in: Circuits and Networks, Electric Power Systems, Electronics, Computer-Aided Design and Optimization, VLSI Systems, Signal Processing, Digital Systems and Computer Engineering, Digital Communication and Communication Networks, Electromagnetics and Control and Systems. About the Editor-in-Chief... Wai-Kai Chen is Professor and Head Emeritus of the Department of Electrical Engineering and Computer Science at the University of Illinois at Chicago. He has extensive experience in education and industry and is very active professionally in the fields of circuits and systems. He was Editor-in-Chief of the *IEEE Transactions on Circuits and Systems*, Series I and II, President of the *IEEE Circuits and Systems Society* and is the Founding Editor and Editor-in-Chief of the *Journal of Circuits, Systems and Computers*. He is the recipient of the Golden Jubilee Medal, the Education Award, and the Meritorious Service Award from the *IEEE Circuits and Systems Society*, and the Third Millennium Medal from the *IEEE*. Professor Chen is a fellow of the *IEEE* and the American Association for the Advancement of Science. * 77 chapters encompass the entire field of electrical engineering. * THOUSANDS of valuable figures, tables, formulas, and definitions. * Extensive bibliographic references.

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Beside technological issues, this book discusses the administrative and industrial aspects of third generation mobile communications. The authors emphasize existing problems and propose solutions. They provide the most comprehensive and topical information on 3G mobile communications currently available. As the first wave of third-generation communication devices arrives, technological and societal effects will be widespread. The ability to communicate via hand-held devices voice, data, and video raises many challenges and questions. Beside detailed looks at technological issues, from the system protocol to implementation technologies, this book discusses the administrative and industrial aspects of third-generation mobile communications. The authors emphasize existing problems and propose solutions. They seek to provide the most comprehensive and topical information on 3G mobile communications currently available. Chapters offer an overview of wireless technology and terminology, protocols for mobility management, the safety of radio-frequency energy, WLAN (wireless local area networks), multiple access schemes, and microwave photonics. It is intended as an introduction and reference for engineers entering the field of wireless communications.

This textbook is intended for a course in electromagnetism for upper undergraduate and graduate students. The main concepts and laws of classical macroscopic electrodynamics and initial information about generalized laws of modern electromagnetics are discussed, explaining some paradoxes of the modern theory. The reader then gets acquainted with electrodynamics methods of field analysis on the basis of wave equation solution. Emission physics are considered using an example of the Huygens-Fresnel-Kirchhoff canonic principle. The representation about strict electrodynamics task statement on the base of Maxwell equations, boundary conditions, emission conditions and the condition on the edge is given. Different classes of approximate boundary conditions are presented, which essentially simplify understanding of process physics. The canonic Fresnel functions are given and their generalization on the case of anisotropic impedance. The free waves in closed waveguides and in strip-slotted and edge-dielectric transmission lines are described. A large number of Mathcad programs for illustration of field patterns and its properties in different guiding structures are provided. The material is organized for self-study as well as classroom use. Electrostatics and dielectric materials have important applications in modern society. As such, they require improved characteristics. More and more equipment needs to operate at high frequency, high voltage, high temperature, and other harsh conditions. This book presents an overview of modern applications of electrostatics and dielectrics as well as research progress in the field.

Providing an ideal transition from introductory to advanced concepts, this book builds a foundation that allows electrical engineers to confidently proceed with the development of advanced EM studies, research, and applications. New topics include quasistatics, vector spherical wave functions, and wave matrices. Several application-oriented sections covering guided waves and transmission lines, particle dynamics, shielding, electromagnetic material characterization, and antennas have also been added. Mathematical appendices present helpful background information in the areas of Fourier transforms, dyadics, and boundary value problems. Key Features Provides extensive end-of-chapter problems. Includes numerous solved examples with detailed explanations and interpretations. Introduces the reader to numerical electromagnetics and integral equations. Each chapter offers an introduction to an important application of electromagnetics. Emphasizes fundamentals, while covering all of the important topics in electromagnetics.

Optical and microwave waveguides have attracted much research interest in both science and industry. The number of potential applications for their use is growing rapidly. This book examines recent advances in the broad field of waveguide technology. It covers current progress and latest breakthroughs in emergent applications in photonics and microwave engineering. The book includes ten contributions on recent developments in waveguide technologies including theory, simulation, and fabrication of novel waveguide concepts as well as reviews on recent advances.

Wireless communications have become invaluable in the modern world. The market is going through a revolutionary transformation as new technologies and standards endeavor to keep up with demand for integrated and low-cost mobile and wireless devices. Due to their ubiquity, there is also a need for a simplification of the design of wireless systems and networks. The Handbook of Research on Advanced Trends in Microwave and Communication Engineering showcases the current trends and approaches in the design and analysis of reconfigurable microwave devices, antennas for wireless applications, and wireless communication technologies. Outlining both theoretical and experimental approaches, this publication brings to light the unique design issues of this emerging research, making it an ideal reference source for engineers, researchers, graduate students, and IT professionals.

Analytical Modeling in Applied Electromagnets encompasses the most complete treatment on the subject published to date, focusing on the nature of models in radio engineering. This leading-edge resource brings you detailed coverage of the latest topics, including metamaterials, photonic bandgaps and artificial impedance surfaces, and applies these concepts to a wide range of applications. The book provides you with working examples that are mainly directed to antenna applications, but the modeling methods and results can be used for other practical devices as well.

In this book, a general frequency domain numerical method similar to the finite difference frequency domain (FDFD) technique is presented. The proposed method, called the multiresolution frequency domain (MRFD) technique, is based on orthogonal Battle-Lemarie and biorthogonal Cohen-Daubechies-Feauveau (CDF) wavelets. The objective of developing this new technique is to achieve a frequency domain scheme which exhibits improved computational efficiency figures compared to the traditional FDFD method: reduced memory and simulation time requirements while retaining numerical accuracy. The newly introduced MRFD scheme is successfully applied to the analysis of a number of electromagnetic problems, such as computation of resonance frequencies of one and three dimensional resonators, analysis of propagation characteristics of general guided wave structures, and electromagnetic scattering from two dimensional dielectric objects. The efficiency characteristics of MRFD techniques based on different wavelets are compared to each other and that of the FDFD method. Results indicate that the MRFD techniques provide substantial savings

in terms of execution time and memory requirements, compared to the traditional FDFD method. Table of Contents: Introduction / Basics of the Finite Difference Method and Multiresolution Analysis / Formulation of the Multiresolution Frequency Domain Schemes / Application of MRFD Formulation to Closed Space Structures / Application of MRFD Formulation to Open Space Structures / A Multiresolution Frequency Domain Formulation for Inhomogeneous Media / Conclusion

The Theory of the Electromagnetism covers the behavior of electromagnetic fields and those parts of applied mathematics necessary to discover this behavior. This book is composed of 11 chapters that emphasize the Maxwell's equations. The first chapter is concerned with the general properties of solutions of Maxwell's equations in matter, which has certain macroscopic properties. The succeeding chapters consider specific problems in electromagnetism, including the determination of the field produced by a variable charge, first in isolation and then in the surface distributions of an antenna. The next two chapters are concerned with the effects of surrounding the medium by a perfectly conducting boundary as in a cavity resonator and as in a waveguide. Other chapters are devoted to discussions on the effect of a plane interface where the properties of the medium change discontinuously; the propagation along cylindrical surfaces; the study of the waves scattered by objects both with and without edges. This book further reviews the harmonic waves and the difficulties involved in going from harmonic waves to those with a more general time dependence. The final chapter provides some information about the classical theory of electrons, magneto-hydrodynamics and waves in a plasma. This book will prove useful to physicists, and physics teachers and students.

Understanding electromagnetic wave theory is pivotal in the design of antennas, microwave circuits, radars, and imaging systems. Researchers behind technology advances in these and other areas need to understand both the classical theory of electromagnetics as well as modern and emerging techniques of solving Maxwell's equations. To this end, the book provides a graduate-level treatment of selected analytical and computational methods. The analytical methods include the separation of variables, perturbation theory, Green's functions, geometrical optics, the geometrical theory of diffraction, physical optics, and the physical theory of diffraction. The numerical techniques include mode matching, the method of moments, and the finite element method. The analytical methods provide physical insights that are valuable in the design process and the invention of new devices. The numerical methods are more capable of treating general and complex structures. Together, they form a basis for modern electromagnetic design. The level of presentation allows the reader to immediately begin applying the methods to some problems of moderate complexity. It also provides explanations of the underlying theories so that their capabilities and limitations can be understood.

Mobile data subscriptions are expected to more than double and mobile wireless traffic to increase by more than tenfold over the next few years. Proliferation of smart phones, tablets, and other portable devices are placing greater demands for services such as

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web browsing, global positioning, video streaming, and video telephony. Many of the proposed solutions to deal with these demands will have a significant impact on antenna designs. Antennas with frequency agility are considered a promising technology to help implement these new solutions. This book provides readers with a sense of the capabilities of frequency-agile antennas (FAAs), the widely diverse methods for achieving tunability, the current achievable performance, and the challenges still facing FAA designs. This resource explores the many aspects of FAAs, including an examination of the metrics used to evaluate their performance, a review of the most commonly used antenna elements, an in-depth look at the wide variety of mechanisms for achieving tunability, and a comprehensive survey of diverse examples of FAA designs. The focus is on FAAs for wireless mobile communications with applications including handsets, laptops, wireless machine-to-machine communications, as well as larger, fixed designs such as cellular base station antennas.

Constitutive parameter extraction from S parameter data using a rectangular waveguide whose cross section is partially filled with a material sample as opposed to being completely filled was examined. One reason for studying a partially filled geometry is to analyze the effect of air gaps between the sample and fixture for the extraction of constitutive parameters. Air gaps can occur in high temperature parameter measurements when the sample was prepared at room temperature. Single port and two port measurement approaches to parameter extraction are also discussed. Park, A. and Dominek, A. K. Unspecified Center AIR; CONSTITUTIVE EQUATIONS; ERROR ANALYSIS; PARAMETER IDENTIFICATION; RECTANGULAR WAVEGUIDES; DIELECTRICS; FILLING; GEOMETRY; HIGH TEMPERATURE; METHOD OF MOMENTS; NETWORK ANALYSIS...

This book presents the lecture notes used in two courses that the late Professor Kasra Barkeshli had offered at Sharif University of Technology, namely, Advanced Electromagnetics and Scattering Theory. The prerequisite for the sequence is vector calculus and electromagnetic fields and waves. Some familiarity with Green's functions and integral equations is desirable but not necessary. The book provides a brief but concise introduction to classical topics in the field. It is divided into three parts including annexes. Part I covers principle of electromagnetic theory. The discussion starts with a review of the Maxwell's equations in differential and integral forms and basic boundary conditions. The solution of inhomogeneous wave equation and various field representations including Lorentz's potential functions and the Green's function method are discussed next. The solution of Helmholtz equation and wave harmonics follow. Next, the book presents plane wave propagation in dielectric and lossy media and various wave velocities. This part concludes with a general discussion of planar and circular waveguides. Part II presents basic concepts of electromagnetic scattering theory. After a brief discussion of radar equation and scattering cross section, the author reviews the canonical problems in scattering. These include the cylinder, the wedge and the sphere. The edge condition for the electromagnetic fields in the vicinity of geometric discontinuities are discussed. The author also presents the low frequency Rayleigh and Born approximations. The integral equation method for the formulation of scattering problems is presented next, followed by an introduction to scattering from periodic structures. Part III is devoted to numerical methods. It begins with finite-

difference methods to solve elliptic equations, and introduces the finite-difference time-domain method for the solution of hyperbolic and parabolic equations. Next, the part turns to the method of moments for the solution of integral equations. This part ends with a short introduction to the finite-element method.

Ferroelectric materials have been and still are widely used in many applications, that have moved from sonar towards breakthrough technologies such as memories or optical devices. This book is a part of a four volume collection (covering material aspects, physical effects, characterization and modeling, and applications) and focuses on the characterization of ferroelectric materials, including structural, electrical and multiphysic aspects, as well as innovative techniques for modeling and predicting the performance of these devices using phenomenological approaches and nonlinear methods. Hence, the aim of this book is to provide an up-to-date review of recent scientific findings and recent advances in the field of ferroelectric system characterization and modeling, allowing a deep understanding of ferroelectricity.

Although microwaves and coherent optics, being two of the largest and most useful branches of electrical engineering to emerge technologically, are usually considered as distinct subjects, many of the underlying fundamental principles, scientific achievements, and practical applications have common features. Following the evolution of the initial principles and techniques during the closing decade of the last century, microwave engineering has long matured to a stage of ready availability of components, automation and accuracy of measurement, economical manufacturing methods, and application of sophisticated systems. Further, this development of electromagnetic phenomena having spatial and temporal coherence has, based on several centuries of study and practice of noncoherent light, in the last two decades reached the optical region. Hence, it is now practicable to consider a comprehensive treatment of these two fields, division being made by subject matter rather than by the artificial distinctions of frequency and/or wavelength ranges. However, a full text on the combined subjects would be very large and unwieldy and, thus, this Bibliography is presented in the hope that it will prove useful as a compact reference source to a large body of workers and, by putting forward the latest scientific and technical advances, stimulate a multi-disciplinary approach. The material of the book commences with the fundamentals of radiation and matter, progressing through components and devices, amplification and generation, transmission, reception and processing of information, and methods of measurement to conclude with a wide range of applications.

Provides a hands-on approach to Radio Frequency and Microwave theory and design

This book provides engineers with a comprehensive guide to Radio Frequency (RF) circuit analysis and wave propagation in order to be able to design new systems.

Emphasis is placed on fundamental concepts, engineering techniques, and the regular and intelligent use of the computer design tools. This book contains a review of wireless history and engineering fundamentals including complex numbers, alternating-current theory, and the logarithmic basis of decibels. The important topics in microwave design theory are discussed, such as transmission lines, the Smith Chart, and matrix algebra. Computer generated examples are used to provide insight into the basic performance, bandwidth, and manufacturing yield of RF and microwave networks. The author also provides a broad presentation of electromagnetic (EM) field theory tailored to the needs of the microwave and RF engineer. Explains how design challenges would be attacked

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in a real engineering environment Reviews AC analysis, Kirchhoff's laws, RLC elements, skin effect, and introduction to the use of computer simulation software

- Covers filter designs for Butterworth, Chebyshev, Bessel and elliptic responses, Kuroda's identities, and Richard's transformation Provides in-text exercises to emphasize a practical approach Includes access to a companion site hosting an instructor's manual High Frequency Technique: An Introduction to RF and Microwave Design and Computer Simulation is a reference for RF, microwave, and wireless engineers, and graduate students in electrical and computer engineering.

Pozar's new edition of Microwave Engineering includes more material on active circuits, noise, nonlinear effects, and wireless systems. Chapters on noise and nonlinear distortion, and active devices have been added along with the coverage of noise and more material on intermodulation distortion and related nonlinear effects. On active devices, there's more updated material on bipolar junction and field effect transistors. New and updated material on wireless communications systems, including link budget, link margin, digital modulation methods, and bit error rates is also part of the new edition. Other new material includes a section on transients on transmission lines, the theory of power waves, a discussion of higher order modes and frequency effects for microstrip line, and a discussion of how to determine unloaded.

This text discusses electromagnetics from the view of operator theory, in a manner more commonly seen in textbooks of quantum mechanics. It includes a self-contained introduction to operator theory, presenting definitions and theorems, plus proofs of the theorems when these are simple or enlightening.

Provides a comprehensive discussion of planar transmission lines and their applications, focusing on physical understanding, analytical approach, and circuit models Planar transmission lines form the core of the modern high-frequency communication, computer, and other related technology. This advanced text gives a complete overview of the technology and acts as a comprehensive tool for radio frequency (RF) engineers that reflects a linear discussion of the subject from fundamentals to more complex arguments. Introduction to Modern Planar Transmission Lines: Physical, Analytical, and Circuit Models Approach begins with a discussion of waves on transmission lines and waves in material medium, including a large number of illustrative examples from published results. After explaining the electrical properties of dielectric media, the book moves on to the details of various transmission lines including waveguide, microstrip line, co-planar waveguide, strip line, slot line, and coupled transmission lines. A number of special and advanced topics are discussed in later chapters, such as fabrication of planar transmission lines, static variational methods for planar transmission lines, multilayer planar transmission lines, spectral domain analysis, resonators, periodic lines and surfaces, and metamaterial realization and circuit models. Emphasizes modeling using physical concepts, circuit-models, closed-form expressions, and full derivation of a large number of expressions Explains advanced mathematical treatment, such as the variation method, conformal mapping method, and SDA Connects each section of the text with forward and backward cross-referencing to aid in personalized self-study Introduction to Modern Planar Transmission Lines is an ideal book for senior undergraduate and graduate students of the subject. It will also appeal to new researchers with the inter-disciplinary background, as well as to engineers and professionals in industries utilizing RF/microwave

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technologies.

Advances in Microwaves, Volume 1 is a collection of papers dealing with the design and fabrication of a two-mile accelerator, optical waveguides, and directional couplers. One paper describes the design and fabrication of the disk-loaded wave guide, which serves as the accelerating structure, of the Stanford two-mile accelerator. Another paper discusses the basic principles of guided propagation, particularly the properties of the confocal lens systems or the "beam guide" variants. One paper describes the main types of directional couplers (namely, waveguide directional couplers, TEM-Mode directional couplers) to help scientists and researchers determine a particular design. Some papers discuss singular integral equations to solve waveguide problems, the application of Lie algebraic theory to microwave networks, and partially filled waveguides and surface waveguides of rectangular cross section. One paper explains the application of the singular integral equation method to rectangular waveguides, including the infinite parallel plate configuration. Another paper cites the exponentially tapered transmission line as an example to show the application of Lie algebras in solving problems related to the microwave field. The collection is suitable for people in the field of applied mathematics, nuclear physics, quantum mechanics, and applied physics.

Balanis' second edition of Advanced Engineering Electromagnetics – a global best-seller for over 20 years – covers the advanced knowledge engineers involved in electromagnetic need to know, particularly as the topic relates to the fast-moving, continually evolving, and rapidly expanding field of wireless communications. The immense interest in wireless communications and the expected increase in wireless communications systems projects (antenna, microwave and wireless communication) points to an increase in the number of engineers needed to specialize in this field. In addition, the Instructor Book Companion Site contains a rich collection of multimedia resources for use with this text. Resources include: Ready-made lecture notes in Power Point format for all the chapters. Forty-nine MATLAB® programs to compute, plot and animate some of the wave phenomena Nearly 600 end-of-chapter problems, that's an average of 40 problems per chapter (200 new problems; 50% more than in the first edition) A thoroughly updated Solutions Manual 2500 slides for Instructors are included.

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