

# *Field Theory of Guided Waves*

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# Field Theory Of Guided Waves

**Changhong Liang, Xi Chen**



## **Field Theory Of Guided Waves:**

**Field Theory of Guided Waves** Robert E. Collin, 1990-12-15 Co published with Oxford University Press Long considered the most comprehensive account of electromagnetic theory and analytical methods for solving waveguide and cavity problems this new Second Edition has been completely revised and thoroughly updated approximately 40% new material Packed with examples and applications FIELD THEORY OF GUIDED WAVES provides solutions to a large number of practical structures of current interest The book includes an exceptionally complete discussion of scalar and Dyadic Green functions Both a valuable review and source of basic information on applied mathematical topics and a hands on source for solution methods and techniques this book belongs on the desk of all engineers working in microwave and antenna systems Sponsored by IEEE Antennas and Propagation Society

**Field Theory of Guided Waves** William Ryland Hill, 1960

**Electromagnetics, Microwave Circuit and Antenna Design for Communications Engineering** Peter Russer, 2003

If you re looking for a clear comprehensive overview of basic electromagnetics principles and applications to antenna and microwave circuit design for communications this authoritative book is your best choice Including concise explanations of all required mathematical concepts needed to fully comprehend the material the book is your complete resource for understanding electromagnetics in current emerging and future broadband communication systems as well as high speed analogue and digital electronic circuits and systems

*Analytical Techniques in the Theory of Guided Waves* Raj Mittra, S. W. Lee, 1971

*Plane-Wave Theory of Time-Domain Fields* Thorkild B. Hansen, Arthur D. Yaghjian, 1999-06-10 This invaluable book provides a comprehensive framework for the formulation and solution of numerous problems involving the radiation reception propagation and scattering of electromagnetic and acoustic waves Filled with original derivations and theorems it includes the first rigorous development of plane wave expansions for time domain electromagnetic and acoustic fields For the past 35 years near field measurement techniques have been confined to the frequency domain Now with the publication of this book probe corrected near field measurement techniques have been extended to ultra wide band short pulse transmitting and receiving antennas and transducers By combining unencumbered straightforward derivations with in depth expositions of prerequisite material the authors have created an invaluable resource for research scientists and engineers in electromagnetics and acoustics and a definitive reference on plane wave expansions and near field measurements Featured topics include An introduction to the basic electromagnetic and acoustic field equations A rigorous development of time domain and frequency domain plane wave representations The formulation of time domain frequency domain and static planar near field measurement techniques with and without probe correction Sampling theorems and computation schemes for time domain and frequency domain fields Analytic signal formulas that simplify the formulation and analysis of transient fields Wave phenomena such as electromagnetic missiles encountered only in the time domain Definitive force and power relations for electromagnetic and acoustic fields and sources Sponsored by IEEE Antennas and Propagation

Society     Electromagnetic Frontier Theory Exploration Changhong Liang,Xi Chen,2019-11-05 This book systematically introduces electromagnetic theories and their applications in practice electrostatic energy Poynting theorem the polarization of waves the conservation law the electromagnetic symmetry the conformal mapping method the electromagnetic loss The parameters and theorems of electromagnetic theories are discussed in detail making the book an essential reference for researchers and engineers in electromagnetics field     *Electromagnetic Field Theory and Transmission Lines* G. S. N. Raju,2006 *Electromagnetic Field Theory and Transmission Lines* is an ideal textbook for a single semester first course on Electromagnetic Field Theory EMFT at the undergraduate level This book uses plain and simple English diagrammatic representations and real life examples to explain the fundamental concepts notations representation and principles that govern the field of EMFT The chapters cover every aspect of EMFT from electrostatics to advanced topics dealing with Electromagnetic Interference EMI Electromagnetic Compatibility EMC EMC standards and design methods for EMC Careful and deta     **Analysis of Electromagnetic Fields and Waves** Reinhold Pregla,2008-04-30 The Method of Lines MOL is a versatile approach to obtaining numerical solutions to partial differential equations PDEs as they appear in dynamic and static problems This method popular in science and engineering essentially reduces PDEs to a set of ordinary differential equations that can be integrated using standard numerical integration methods Its significant advantage is that the analysis algorithms follow the physical wave propagation and are therefore efficient This is because the fields on the discretisation lines are described by generalised transmission line GTL equations With this formulation we have a connection to the well known transmission line theory and resulting in an easy understanding The method of lines is a very accurate and powerful way to analyze electromagnetic waves enabling a full wave solution without the computational burden of pure finite element or finite difference methods With *Analysis of Electromagnetic Fields and Waves* Reinhold Pregla describes an important and powerful method for analyzing electromagnetic waves This book Describes the general analysis principles for electromagnetic fields Includes applications in microwave millimetre wave and optical frequency regions Unifies the analysis by introducing generalised transmission line GTL equations for all orthogonal coordinate systems and with materials of arbitrary anisotropy as a common start point Demonstrates a unique analysis principle with the numerical stable impedance admittance transformation and a physical adapted field transformation concept that is also useful for other modelling algorithms Includes chapters on Eigenmode calculations for various waveguides concatenations and junctions of arbitrary number of different waveguide sections in complex devices periodic structures e g Bragg gratings meander lines clystron resonators photonic crystals antennas e g circular and conformal Enables the reader to solve partial differential equations in other physical areas by using the described principles Features an accompanying website with program codes in Matlab for special problems *Analysis of Electromagnetic Fields and Waves* will appeal to electromagnetic field practitioners in primary and applied research as well as postgraduate students in the areas of photonics micro and millimetre waves general

electromagnetics e g microwave integrated circuits antennas integrated and fibre optics optoelectronics nanophotonics microstructures artificial materials

**Theory and Computation of Electromagnetic Fields in Layered Media** Vladimir Okhmatovski, Shucheng Zheng, 2024-04-09 Explore the algorithms and numerical methods used to compute electromagnetic fields in multi layered media In Theory and Computation of Electromagnetic Fields in Layered Media two distinguished electrical engineering researchers deliver a detailed and up to date overview of the theory and numerical methods used to determine electromagnetic fields in layered media The book begins with an introduction to Maxwell s equations the fundamentals of electromagnetic theory and concepts and definitions relating to Green s function It then moves on to solve canonical problems in vertical and horizontal dipole radiation describe Method of Moments schemes discuss integral equations governing electromagnetic fields and explains the Michalski Zheng theory of mixed potential Green s function representation in multi layered media Chapters on the evaluation of Sommerfeld integrals procedures for far field evaluation and the theory and application of hierarchical matrices are also included along with A thorough introduction to free space Green s functions including the delta function model for point charge and dipole current Comprehensive explorations of the traditional form of layered medium Green s function in three dimensions Practical discussions of electro quasi static and magneto quasi static fields in layered media including electrostatic fields in two and three dimensions In depth examinations of the rational function fitting method including direct spectra fitting with VECTFIT algorithms Perfect for scholars and students of electromagnetic analysis in layered media Theory and Computation of Electromagnetic Fields in Layered Media will also earn a place in the libraries of CAD industry engineers and software developers working in the area of computational electromagnetics

**Electromagnetic Field Theory Fundamentals** Bhag Singh Guru, Hüseyin R. Hiziroglu, 2009-07-23 Guru and Hiziroglu have produced an accessible and user friendly text on electromagnetics that will appeal to both students and professors teaching this course This lively book includes many worked examples and problems in every chapter as well as chapter summaries and background revision material where appropriate The book introduces undergraduate students to the basic concepts of electrostatic and magnetostatic fields before moving on to cover Maxwell s equations propagation transmission and radiation Chapters on the Finite Element and Finite Difference method and a detailed appendix on the Smith chart are additional enhancements MathCad code for many examples in the book and a comprehensive solutions set are available at [www.cambridge.org](http://www.cambridge.org) 9780521830164

**Electromagnetic Wave Theory** J. C. Brown, 2016-01-21 International Series of Monographs in Electromagnetic Waves Volume 11 Electromagnetic Wave Theory Part 1 covers the proceedings of an International Scientific Radio Union U R S I Symposium on Electromagnetic Wave Theory The book contains 61 chapters that are organized into three sections The first section presents papers about wave propagation which includes lateral waves terrestrial waveguides and plane waves in dissipative media Next the title reviews studies about wave guides including basic properties of periodic waveguides theoretical investigation of non uniform

waveguides and waves in a coaxial line partially filled with plasma The last section covers topics about surface waves such as a dielectric prism in the corner of overmoded waveguide lasers and optical communication systems and microwave and laser resonators The text will be of great use to researchers and practitioners of disciplines that study or utilize electromagnetic wave technologies such as electrotechnics and electrical engineering      **Millimeter-Wave Waveguides** Dmitri

Lioubtchenko, Sergei Tretyakov, Sergey Dudorov, 2007-05-08 Millimeter Wave Waveguides is a monograph devoted to open waveguides for millimeter wave applications In the first chapters general waveguide theory is presented with the emphasis on millimeter wave applications Next the book systematically describes the results of both theoretical and experimental studies of rectangular dielectric rod waveguides with high dielectric permittivities Simple and accurate methods for propagation constant calculations for isotropic as well as anisotropic dielectric waveguides are described Both analytical and numerical approaches are covered Different types of transitions have been simulated in order to find optimal configurations as well as optimal dimensions of dielectric waveguides for the frequency band of 75 110 GHz Simple and effective design is presented The experimental studies of dielectric waveguides show that Sapphire waveguide can be utilized for this frequency band as a very low loss waveguide Design of antennas with low return loss based on dielectric waveguides is also described

**Theory and Computation of Electromagnetic Fields** Jian-Ming Jin, 2015-08-26 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      **Conformal Array Antenna Theory and Design** Lars Josefsson, Patrik Persson, 2006-02-03 This is the first comprehensive treatment of conformal antenna arrays from an engineering perspective While providing a thorough foundation in theory the authors of

this publication provide a wealth of hands on instruction for practical analysis and design of conformal antenna arrays Thus you get the knowledge you need alongside the practical know how to design antennas that are integrated into such structures aircrafts or skyscrapers

*Theory and Phenomena of Metamaterials* Filippo Capolino,2017-12-19 Theory and Phenomena of Metamaterials offers an in depth look at the theoretical background and basic properties of electromagnetic artificial materials often called metamaterials A volume in the Metamaterials Handbook this book provides a comprehensive guide to working with metamaterials using topics presented in a concise review format along with numerous references With contributions from leading researchers this text covers all areas where artificial materials have been developed Each chapter in the text features a concluding summary as well as various cross references to address a wide range of disciplines in a single volume

Spheroidal Wave Functions in Electromagnetic Theory Le-Wei Li,Xiao-Kang Kang,Mook-Seng Leong,2004-03-22 The flagship monograph addressing the spheroidal wave function and its pertinence to computational electromagnetics Spheroidal Wave Functions in Electromagnetic Theory presents in detail the theory of spheroidal wave functions its applications to the analysis of electromagnetic fields in various spheroidal structures and provides comprehensive programming codes for those computations The topics covered in this monograph include Spheroidal coordinates and wave functions Dyadic Green s functions in spheroidal systems EM scattering by a conducting spheroid EM scattering by a coated dielectric spheroid Spheroid antennas SAR distributions in a spheroidal head model The programming codes and their applications are provided online and are written in Mathematica 3 0 or 4 0 Readers can also develop their own codes according to the theory or routine described in the book to find subsequent solutions of complicated structures Spheroidal Wave Functions in Electromagnetic Theory is a fundamental reference for scientists engineers and graduate students practicing modern computational electromagnetics or applied physics

**Foundations of Antenna Radiation Theory** Wen Geyi,2023-03-24 Foundations of Antenna Radiation Theory Understand the theory and function of wireless antennas with this comprehensive guide As wireless technology continues to develop understanding of antenna properties and performance will only become more critical Since antennas can be understood as junctions of waveguides eigenmode analysis the foundation of waveguide theory concerned with the unexcited states of systems and their natural resonant characteristics promises to be a crucial frontier in the study of antenna theory Foundations of Antenna Radiation Theory incorporates the modal analysis generic antenna properties and design methods discovered or developed in the last few decades not being reflected in most antenna books into a comprehensive introduction to the theory of antennas This book puts readers into conversation with the latest research and situates students and researchers at the cutting edge of an important field of wireless technology The book also includes Detailed discussions of the solution methods for Maxwell equations and wave equations to provide a theoretical foundation for electromagnetic analysis of antennas Recent developments for antenna radiation in closed and open space modal analysis and field expansions dyadic Green s functions

time domain theory state of the art antenna array synthesis methods wireless power transmission systems and more Innovative material derived from the author s own research Foundations of Antenna Radiation Theory is ideal for graduate or advanced undergraduate students studying antenna theory as well as for reference by researchers engineers and industry professionals in the areas of wireless technology      *Optical Waveguide Theory* Yury Shestopalov,Yury Smirnov,Eugene Smolkin,2022-03-26 This book addresses the most advanced to date mathematical approach and numerical methods in electromagnetic field theory and wave propagation It presents the application of developed methods and techniques to the analysis of waves in various guiding structures shielded and open metal dielectric waveguides of arbitrary cross section planar and circular waveguides filled with inhomogeneous dielectrics metamaterials chiral media anisotropic media and layered media with absorption It also looks into spectral properties of wave propagation for the waveguide families being considered and the relevant mathematical techniques such as spectral theory of non self adjoint operator valued functions are described including rigorous proofs of the existence of various types of waves Further numerical methods constructed on the basis of the presented mathematical approach and the results of numerical modeling for various structures are also described in depth The book is beneficial to a broad spectrum of readers ranging from pure and applied mathematicians in electromagnetic field theory to researchers and engineers who are familiar with mathematics Further it is also useful as a supplementary text for upper level undergraduate students interested in learning more advanced topics of mathematical methods in electromagnetics      Electromagnetics for Engineering Students Part I Sameir M. Ali Hamed,2017-09-20 Electromagnetics for Engineering Students starts with an introduction to vector analysis and progressive chapters provide readers with information about dielectric materials electrostatic and magnetostatic fields as well as wave propagation in different situations Each chapter is supported by many illustrative examples and solved problems which serve to explain the principles of the topics and enhance the knowledge of students In addition to the coverage of classical topics in electromagnetics the book explains advanced concepts and topics such as the application of multi pole expansion for scalar and vector potentials an in depth treatment for the topic of the scalar potential including the boundary value problems in cylindrical and spherical coordinates systems metamaterials artificial magnetic conductors and the concept of negative refractive index Key features of this textbook include detailed and easy to follow presentation of mathematical analyses and problems a total of 681 problems 162 illustrative examples 88 solved problems and 431 end of chapter problems an appendix of mathematical formulae and functions Electromagnetics for Engineering Students is an ideal textbook for first and second year engineering students who are learning about electromagnetism and related mathematical theorems      **Selected Papers on Coupled-mode Theory in Guided-wave Optics** Dennis G. Hall,1993 SPIE Milestones are collections of seminal papers from the world literature covering important discoveries and developments in optics and photonics



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