Numerical Solution of Antennas in Layered Media

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David B. Davidson

Numerical Solution Of Antennas In Layered Media:

   Numerical Solution of Antennas in Layered Media Volkert W. Hansen,1989   **Numerical Solution of Antennas in Layered Media** Volkert W. Hansen,1989 This monograph presents a variety of methods for the numerical solution of practical problems especially transient responses in layered media which occur in microwave antenna installations Provides a survey of the present state of research covering the modern applications of methods such as Green s function and the Sommerfield integrals to practical problems involving dipoles focusing antennas and model calculations   Computational Electromagnetics for RF and Microwave Engineering David B. Davidson,2005-02-24 The numerical approximation of Maxwell s equations Computational Electromagnetics CEM has emerged as a crucial enabling technology for radio frequency microwave and wireless engineering The three most popular full wave methods the Finite Difference Time Domain Method the Method of Moments and the Finite Element Method are introduced in this book by way of one or two dimensional problems Commercial or public domain codes implementing these methods are then applied to complex real world engineering problems and a careful analysis of the reliability of the results obtained is performed along with a discussion of the many pitfalls which can result in inaccurate and misleading solutions The book will empower readers to become discerning users of CEM software with an understanding of the underlying methods and confidence in the results obtained It also introduces readers to the art of code development Aimed at senior undergraduate graduate students taking CEM courses and practising engineers in the industry   Mathematical Models and Numerical Methods for Full Wave Analysis of Prolate and Oblate Spheroidal Conformal Microwave Components Saif Al-Hasson,2014-08-29 Conformal components are used nowadays at higher rate than ever before They can be found in curved mobile phones communication navigation and imaging systems in land water air and space vehicles The integration of those components within the external structure became of significant importance for aerodynamic electromagnetic aesthetic or physical reasons As a result many mathematical models were previously developed to analyze and optimize such conformed devices In this thesis we contributed to this field by developing various models for full wave analysis of spheroidal components As a starting point mathematical formulas for conforming antennas on oblate and prolate spheroids were obtained Those conformation methods were validated by conforming many antennas on spheroidal surfaces They were then used to formulate Method of Moments equations with spheroidally curved current functions for analyzing wire antennas of random shape conformed to spheroids in the frequency domain The complete model was applied to a conformal Archimedean spiral antenna on an oblate spheroid and showed that the conformed spiral has similar current distribution as its planar counterpart but produces an unsymmetrical radiation pattern The obtained model was then extended to spheroidal multi layer structures by integrating the spheroidal dyadic Green s Function within its mathematical derivation However due to a detected divergence in that function the model couldn t be implemented On the side of time based analysis methods a Finite Difference Time Domain method was developed

for closed oblate and prolate spheroidal structures Alternative formulas for the structure s singularities and the condition of numerical stability were derived as well The obtained model was then validated and used to characterize spheroidal cavities in the time and frequency domains The method was extended later to unbounded spheroidal domain by deriving the Absorbing Boundary Conditions using the One Way Wave method The whole model was then applied to characterize a patch antenna conformed to a prolate spheroid Finally an analytical solution for the transient fields in spherical multilayer media energized by spherical harmonics source and an algorithm for tracing back the path of all the reflected waves were obtained The model was applied to different multilayer structures where the transient response was obtained and validated against a numerical solution   *Antenna Theory and Design* Warren L. Stutzman,Gary A. Thiele,2012-05-22 Stutzman s 3rd edition of Antenna Theory and Design provides a more pedagogical approach with a greater emphasis on computational methods New features include additional modern material to make the text more exciting and relevant to practicing engineers new chapters on systems low profile elements and base station antennas organizational changes to improve understanding more details to selected important topics such as microstrip antennas and arrays and expanded measurements topic

Computational Methods and Experimental Measurements XIII C. A. Brebbia,G. M. Carlomagno,2007 Containing papers presented at the Thirteenth International Conference in this well established series on CMEM Computational Methods and Experimental Measurements These proceedings review state of the art developments on the interaction between numerical methods and experimental measurements Featured topics include Computational and Experimental Methods Experimental and Computaqional Analysis Computer Interaction and Control of Experiments Direct Indirect and In Situ Measurements Particle Methods Structural and Stress Analysis Structural Dynamics Dynamics and Vibrations Electrical and Electromagnetic Applications Biomedical Applications Heat Transfer Thermal Processes Fluid Flow Data Acquisition Remediation and Processing and Industrial Applications   *Computational Methods for Electromagnetic and Optical Systems, Second Edition* John M. Jarem,Partha P. Banerjee,2011 This text examines a variety of spectral computational techniques including k space theory Floquet theory and beam propagation that are used to analyze electromagnetic and optical problems The authors tie together different applications in EM and optics in which the state variable method is used Emphasizing the analysis of planar diffraction gratings using rigorous coupled wave analysis the book presents many cases that are analyzed using a full field vector approach to solve Maxwell s equations in anisotropic media where a standard wave equation approach is intractable   **Antenna Radar Cross Section: Theory and Design** Ying Liu,Yongtao Jia,Shuxi Gong,2025-04-19 This is the first book to focus specifically on antenna RCS reduction theory and design approaches It covers both principles and engineering practice and provides an in depth study of a number of important topics including fundamental theory antenna and array analysis models the rapid numerical computation method and various low RCS antenna design methods The comprehensive and systematic discussion of practical issues in antenna RCS reduction makes it

an ideal resource for readers interested in practical solutions to antenna stealth particularly researchers engineers and graduate students in the fields of microwave engineering electrical and electronic engineering and telecommunications engineering   Computational Methods for Electromagnetic and Optical Systems John M. Jarem,Partha P. Banerjee,2016-04-19 The current rapid and complex advancement applications of electromagnetic EM and optical systems calls for a much needed update on the computational methods currently in use Completely revised and reflecting ten years of develoments this second edition of the bestselling Computational Methods for Electromagnetic and Optical Systems provides the update so desperately needed in this field Offering a wealth of new material this second edition begins with scalar wave propagation and analysis techniques chiral and metamaterials and photonic band gap structures It examines Pontying vector and stored energy as well as energy group and phase velocities reviews k space state variable formation with applications to anistropic planar systems and presents full field rigorous coupled wave analysis of planar diffraction gratings with applications to H mode E mode crossed gratings single and multilayered diffraction grating analysis and diffraction from anistropic gratings Later chapters highlight spectral techniques and RCWA as applied to the analysis of dynamic wave mixing in PR materials with induced transmission and reflection gratings and demonstrate the RCWA algorithm to analyze cylindrical and spherical systems using circular bipolar cylindrical and spherical coordinates The book concludes with several RCWA computational case studies involving scattering from spatially inhomogeneous eccentric circular cylinders solved in bipolar coordinates Many of these examples apply the complex Poynting theorem or the forwardscattering optical theorem to validate numerical solutions by verifying power conservation Using common computational tools such as Fortran MATLAB COMSOL and RSOFT the text offers numerous examples to illuminate the material many of which employ a full field vector approach to analyze and solve Maxwell s equations in anisotropic media where a standard wave equation approach is intractable Designed to introduce novel spectral computational techniques the book demonstrates the application of these methods to analyze a variety of EM and optical systems   **Recent Technical Developments in Energy-Efficient 5G Mobile Cells** Raed A. Abd-Alhameed,Issa Elfergani,Jonathan Rodriguez,2020-06-17 This book addresses the true innovation in engineering design that may be promoted by blending together models and methodologies from different disciplines and in this book the target was exactly to follow this approach to deliver a new disruptive architecture to deliver these next generation mobile small cell technologies According to this design philosophy the work within this book resides in the intersection of engineering paradigms that includes cooperation network coding and smart energy aware frontends These technologies will not only be considered as individual building blocks but re engineered according to an inter design approach resulting in the enabler for energy efficient femtocell like services on the move The book aims to narrow the gap between the current networking technologies and the foreseen requirements that are targeted at the future development of the 5G mobile and wireless communications networks in terms of the higher networking capacity the ability to support more

users the lower cost per bit the enhanced energy efficiency and adaptability to new services and devices for example smart cities and the Internet of things IoT   **Ground Penetrating Radar** Mohammed Serhir,Dominique Lesselier,2024-05-29 This book offers an overview of modern advances in Ground Penetrating Radar GPR for the reader hoping to understand comprehensive electromagnetic culture combining instrumental development of radar signal processing imaging and calibration correction of measured data GPR has a multi disciplinary character that can bring together a diverse and broad community Of concern are the design and optimization of innovative radars by virtue of the antennas and associated electronics imaging algorithms methodological diversity calibration procedures and the development of tools for the interpretation of data in mono static or multi static configurations within frequency or transient domains This book provides illustrations in civil engineering for the diagnosis of transport infrastructures and buildings archeological surveys for the appreciation of cultural heritage detection of underground pipes and cavities estimation of soil water content for agriculture and mapping of root trees developing underground and in planetology the analysis of the internal structure of planets and other celestial bodies through electromagnetic waves   **CAD of Wire Antennas and Related Radiating Structures** Branko D. Popović,1991 A discourse on the computer aided design of wire antennas which provides numerous examples of the scope of CAD processes including descriptions of the WireZeus based CAD of antennas and related radiating structures along with their matching networks   **Waves and Fields in Inhomogenous Media** Weng Cho Chew,1999-02-02 Electrical Engineering Electromagnetics Waves and Fields in Inhomogeneous Media A Volume in the IEEE Press Series on Electromagnetic Waves Donald G Dudley Series Editor it is one of the best wave propagation treatments to appear in many years Gerardo G Tango CPG Consulting Seismologist Acoustician Covington LA This comprehensive text thoroughly covers fundamental wave propagation behaviors and computational techniques for waves in inhomogeneous media The author describes powerful and sophisticated analytic and numerical methods to solve electromagnetic problems for complex media and geometry as well Problems are presented as realistic models of actual situations which arise in the areas of optics radio wave propagation geophysical prospecting nondestructive testing biological sensing and remote sensing Key topics covered include Analytical methods for planarly cylindrically and spherically layered media Transient waves including the Cagniard de Hoop method Variational methods for the scalar wave equation and the electromagnetic wave equation Mode matching techniques for inhomogeneous media The Dyadic Green s function and its role in simplifying problem solving in inhomogeneous media Integral equation formulations and inverse problems Time domain techniques for inhomogeneous media This book will be of interest to electromagnetics and remote sensing engineers physicists scientists and geophysicists This IEEE Press reprinting of the 1990 version published by Van Nostrand Reinhold incorporates corrections and minor updating Also in the series Mathematical Foundations for Electromagnetic Theory by Donald G Dudley University of Arizona at Tucson This volume in the series lays the mathematical foundations for the study of advanced topics in electromagnetic

theory Important subjects covered include linear spaces Green s functions spectral expansions electromagnetic source representations and electromagnetic boundary value problems 1994 Hardcover 264 pp ISBN 0 7803 1022 5 IEEE Order No PC3715 About the Series The IEEE Press Series on Electromagnetic Waves consists of new titles as well as reprints and revisions of recognized classics that maintain long term archival significance in electromagnetic waves and applications Designed specifically for graduate students practicing engineers and researchers this series provides affordable volumes that explore electromagnetic waves and applications beyond the undergraduate level *Theory of Electromagnetic Well Logging* C. Richard Liu,2017-01-31 Theory of Electromagnetic Well Logging provides a much needed and complete analytical method for electromagnetic well logging technology The book presents the physics and mathematics behind the effective measurement of rock properties using boreholes allowing geophysicists petrophysisists geologists and engineers to interpret them in a more rigorous way Starting with the fundamental concepts the book then moves on to the more classic subject of wireline induction logging before exploring the subject of LWD logging concluding with new thoughts on electromagnetic telemetry Theory of Electromagnetic Well Logging is the only book offering an in depth discussion of the analytical and numerical techniques needed for expert use of those new logging techniques Features in depth analysis of the analytical and numerical techniques needed for expert use of logging techniques Includes software codes providing a handy tool for understanding logging tool physics and design of new logging tools Provides a detailed glossary of all key terms within the introductory chapter **Scientific and Technical Aerospace Reports** ,1994 *Civil Engineering Applications of Ground Penetrating Radar* Andrea Benedetto,Lara Pajewski,2015-04-07 This book based on Transport and Urban Development COST Action TU1208 presents the most advanced applications of ground penetrating radar GPR in a civil engineering context with documentation of instrumentation methods and results It explains clearly how GPR can be employed for the surveying of critical transport infrastructure such as roads pavements bridges and tunnels and for the sensing and mapping of underground utilities and voids Detailed attention is also devoted to use of GPR in the inspection of geological structures and of construction materials and structures including reinforced concrete steel reinforcing bars and pre post tensioned stressing ducts Advanced methods for solution of electromagnetic scattering problems and new data processing techniques are also presented Readers will come to appreciate that GPR is a safe advanced non destructive and noninvasive imaging technique that can be effectively used for the inspection of composite structures and the performance of diagnostics relevant to the entire life cycle of civil engineering works Mathematical Geophysics N.J. Vlaar,G. Nolet,M.J.R. Wortel,S.A.P.L. Cloetingh,2012-12-06 The contributions to this book follow a topical trend In several geophysical fields evidence is accumulating concerning the deviation of the earth s structure from radial symmetry Seismology provides the most adequate resolution for revealing the earth s lateral inhomogeneity on a global to local scale Lateral structure in the density distribution is also manifest in the earth s gravity field and in the geoid Asphericity in physical parameters generally

supposed only to vary with the vertical coordinate has a profound influence on geodynamics The effects of these deviations from spherical symmetry concern in particular convection theory post glacial rebound and the dynamics of the lithosphere and upper mantle in general At the 16th International Conference on Mathematical Geophysics which was held in Oosterbeek the Netherlands in 1986 the need was felt to present the state of the art Several prospective authors were found interested to contribute to the present book This Oosterbeek conference was one in a long series of topical conferences starting with the Upper Mantle Project Symposia on Geophysical Theory and Computers in the 1960s and thence their successors the conferences on Mathematical Geophysics until the present **Advanced Ultrawideband Radar** James D. Taylor,2016-12-19 This book presents the latest theory developments and applications related to high resolution materials penetrating sensor systems An international team of expert researchers explains the problems and solutions for developing new techniques and applications Subject areas include ultrawideband UWB signals propagation and scattering materials penetrating radar techniques for small object detection and imaging biolocation using holographic techniques tomography medical applications nondestructive testing methods electronic warfare principles through the wall radar propagation effects and target identification through measuring the target return signal spectrum changes *Research in Progress* United States. Army Research Office,1985 Vols for 1977 consist of two parts Chemistry biological sciences engineering sciences metallurgy and materials science issued in the spring and Physics electronics mathematics geosciences issued in the fall Proceedings of International conference on Antenna Technologies ,2005

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