

Acoustic & Electromagnetic Scattering Analysis

Using Discrete Sources

Adrian Dolcu, Yuri Eremin and Thomas Whited



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Y Pai

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Acoustic and Electromagnetic Scattering Analysis Using Discrete Sources Adrian Doicu, Yuri A. Eremin, Thomas Wriedt, 2000-07-06 The discrete sources method is an efficient and powerful tool for solving a large class of boundary value problems in scattering theory A variety of numerical methods for discrete sources now exist In this book the authors unify these formulations in the context of the so called discrete sources method Comprehensive presentation of the discrete sources method Original theory an extension of the conventional null field method using discrete sources Practical examples that demonstrate the efficiency and flexibility of elaborated methods scattering by particles with high aspect ratio rough particles nonaxisymmetric particles multiple scattering List of discrete sources programmes available via the Internet

Electromagnetic Scattering by Particles and Particle Groups Michael I. Mishchenko, 2014-04-24 This self contained and accessible book provides a thorough introduction to the basic physical and mathematical principles required in studying the scattering and absorption of light and other electromagnetic radiation by particles and particle groups For the first time the theories of electromagnetic scattering radiative transfer and weak localization are combined into a unified consistent branch of physical optics directly based on the Maxwell equations A particular focus is given to key aspects such as time and ensemble averaging at different scales ergodicity and the physical nature of measurements afforded by actual photopolarimeters Featuring over 120 end of chapter exercises with hints and solutions provided this clear one stop resource is ideal for self study or classroom use and will be invaluable to both graduate students and researchers in remote sensing physical and biomedical optics optical communications optical particle characterization atmospheric physics and astrophysics

Electromagnetic Wave Scattering on Nonspherical Particles Tom Rother, Michael Kahnert, 2013-09-19 This book gives a detailed overview of the theory of electromagnetic wave scattering on single homogeneous but nonspherical particles Beside the systematically developed Green s function formalism of the first edition this second and enlarged edition contains additional material regarding group theoretical considerations for nonspherical particles with boundary symmetries an iterative T matrix scheme for approximate solutions and two additional but basic applications Moreover to demonstrate the advantages of the group theoretical approach and the iterative solution technique the restriction to axisymmetric scatterers of the first edition was abandoned

The Generalized Multipole Technique for Light Scattering Thomas Wriedt, Yuri Eremin, 2018-03-09 This book presents the Generalized Multipole Technique as a fast and powerful theoretical and computation tool to simulate light scattering by nonspherical particles It also demonstrates the considerable potential of the method In recent years the concept has been applied in new fields such as simulation of electron energy loss spectroscopy and has been used to extend other methods like the null field method making it more widely applicable The authors discuss particular implementations of the GMT methods such as the Discrete Sources Method DSM Multiple Multipole Program MMP the Method of Auxiliary Sources MAS the Filamentary Current Method FCM the Method of Fictitious Sources MFS and the

Null Field Method with Discrete Sources NFM DS The Generalized Multipole Technique is a surface based method to find the solution of a boundary value problem for a given differential equation by expanding the fields in terms of fundamental or other singular solutions of this equation The amplitudes of these fundamental solutions are determined from the boundary condition at the particle surface Electromagnetic and light scattering by particles or systems of particles has been the subject of intense research in various scientific and engineering fields including astronomy optics meteorology remote sensing optical particle sizing and electromagnetics which has led to the development of a large number of modelling methods based on the Generalized Multipole Technique for quantitative evaluation of electromagnetic scattering by particles of various shapes and compositions The book describes these methods in detail

Exploring the Atmosphere by Remote Sensing Techniques Rodolfo Guzzi, 2008-01-11 Only satellite based remote sensing instruments generate the wealth of global data on the concentrations of atmospheric constituents that are necessary for long term monitoring of the atmosphere This set of courses and lectures sponsored by ICTP in Trieste focuses on remote sensing for atmospheric applications and inverse methods to assess atmospheric components gases aerosols and clouds It addresses primarily graduate students and young researchers in the atmospheric sciences but will be useful for all those wishing to study various techniques for exploring the atmosphere by remote sensing Contributions span topics such as on IGOS Integrated Global Observing Strategy electromagnetic scattering by non spherical particles forward modelling requirements and the information content problem Earth radiation and aerosol monitoring by LIDAR

Mathematical Modeling in Diffraction Theory Alexander G. Kyurkchan, Nadezhda I. Smirnova, 2015-09-19 Mathematical Modeling in Diffraction Theory Based on A Priori Information on the Analytical Properties of the Solution provides the fundamental physical concepts behind the theory of wave diffraction and scattered wave fields as well as its application in radio physics acoustics optics radio astronomy biophysics geophysics and astrophysics This book provides a coherent discussion of several advanced topics that have the potential to push forward progress in this field It begins with examples illustrating the importance of taking a priori information into account when developing algorithms for solving diffraction problems with subsequent chapters discussing the basic analytical representations of wave fields the auxiliary current and source methods for solving the problems of diffraction at compact scatterers the null field and matrix methods that are widely used to solve problems in radio physics radio astronomy and biophysics and the continued boundary condition and pattern equation method Provides ideas and techniques for obtaining a priori information on analytical properties of wave fields and provides methods for solving diffraction problems Includes numerous concrete examples of localization of singularities of analytical continuation of wave fields Presents a qualitative explanation of the formation of shadows of objects Formulates the concept of invisible objects Supplies appropriate computer programs for all presented methods

Laser Metrology in Fluid Mechanics Alain Boutier, 2013-02-20 In fluid mechanics non intrusive measurements are fundamental in order to improve knowledge of the behavior and main physical phenomena of

flows in order to further validate codes The principles and characteristics of the different techniques available in laser metrology are described in detail in this book Velocity temperature and concentration measurements by spectroscopic techniques based on light scattered by molecules are achieved by different techniques laser induced fluorescence coherent anti Stokes Raman scattering using lasers and parametric sources and absorption spectroscopy by tunable laser diodes which are generally better suited for high velocity flows The size determination of particles by optical means a technique mainly applied in two phase flows is the subject of another chapter along with a description of the principles of light scattering For each technique the basic principles are given as well as optical devices and data processing A final chapter reminds the reader of the main safety precautions to be taken when using powerful lasers

Light Scattering Reviews 4 Alexander A. Kokhanovsky, 2009-07-25 This fourth volume of Light Scattering Reviews is composed of three parts The first part is concerned with theoretical and experimental studies of single light scattering by small nonspherical particles Light scattering by small particles such as for instance droplets in the terrestrial clouds is a well understood area of physical optics On the other hand exact theoretical calculations of light scattering patterns for most of nonspherical and irregularly shaped particles can be performed only for the restricted values of the size parameter which is proportional to the ratio of the characteristic size of the particle to the wavelength For the large nonspherical particles approximations are used e.g. ray optics The exact theoretical techniques such as the T matrix method cannot be used for extremely large particles such as those in ice clouds because then the size parameter in the vixle 2 a where a is the characteristic size radius for spheres and the associated numerical codes become unstable and produce wrong answers Yet another problem is due to the fact that particles in many turbid media e.g. dust clouds cannot be characterized by a single shape Often refractive indices also vary Because of problems with theoretical calculations experimental laboratory investigations are important for the characterization and understanding of the optical properties of such types of particles The first paper in this volume written by B. Gustafson is aimed at the description of scaled analogue experiments in electromagnetic scattering

Multiple Scattering of Light by Particles Michael I. Mishchenko, Larry D. Travis, Andrew A. Lacis, 2006-04-27 This monograph on multiple scattering of light by small particles is an ideal resource for science professionals engineers and graduate students

Plasmonics and Plasmonic Metamaterials G. Shvets, Igor Tsukerman, 2012 Manipulation of plasmonics from nano to micro scale 1 Introduction 2 Form Birefringent metal and its plasmonic anisotropy 3 Plasmonic photonic crystal 4 Fourier plasmonics 5 Nanoscale optical field localization 6 Conclusions and outlook 11 Dielectric loaded plasmonic waveguide components 1 Introduction 2 Design of waveguide dimensions 3 Sample preparation and near field characterization 4 Excitation and propagation of guided modes 5 Waveguide bends and splitters 6 Coupling between waveguides 7 Waveguide ring resonators 8 Bragg gratings 9 Discussion 12 Manipulating nanoparticles and enhancing spectroscopy with surface plasmons 1 Introduction 2 Propulsion of gold nanoparticles with surface plasmon polaritons 3 Double resonance substrates

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