



World Scientific Series in Contemporary Chemical Physics — Vol. 19

MODIFIED MAXWELL EQUATIONS IN QUANTUM ELECTRODYNAMICS

Henning F Harmuth
Terence W Barrett
Beate Meffert

$$H_E(0, \theta) / E_0 Z^{-1}$$

$$\text{curl} \mathbf{H} = \frac{\partial \mathbf{D}}{\partial t} + \mathbf{g}_e$$

$$-\text{curl} \mathbf{E} = \frac{\partial \mathbf{B}}{\partial t} + \mathbf{g}_m$$

$$H_E(3, \theta) / E_0 Z^{-1}$$

World Scientific

Modified Maxwell Equations In Quantum Electrodynamics

Daniele Funaro



Modified Maxwell Equations In Quantum Electrodynamics:

Modified Maxwell Equations In Quantum Electrodynamics Terence William Barrett, Henning F. Harmuth, Beate Meffert, 2001-11-19 Divergencies in quantum field theory referred to as infinite zero point energy have been a problem for 70 years. Renormalization has always been considered an unsatisfactory remedy. In 1985 it was found that Maxwell's equations generally do not have solutions that satisfy the causality law. An additional term for magnetic dipole currents corrected this shortcoming. Rotating magnetic dipoles produce magnetic dipole currents just as rotating electric dipoles in a material like barium titanate produce electric dipole currents. Electric dipole currents were always part of Maxwell's equations. This book shows that the correction of Maxwell's equations eliminates the infinite zero point energy in quantum electrodynamics. In addition, it presents many more new results.

Modified Maxwell Equations in Quantum Electrodynamics Henning F. Harmuth, Terence William Barrett, Beate Meffert, 2001

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Modified Maxwell Equations in Quantum Electrodynamics Henning F. Harmuth, Terence William Barrett, Beate Meffert, 2001 Divergencies in quantum field theory referred to as infinite zero point energy have been a problem for 70 years. Renormalization has always been considered an unsatisfactory remedy. In 1985 it was found that Maxwell's equations generally do not have solutions that satisfy the causality law. An additional term for magnetic dipole currents corrected this shortcoming. Rotating magnetic dipoles produce magnetic dipole currents just as rotating electric dipoles in a material like barium titanate produce electric dipole currents. Electric dipole currents were always part of Maxwell's equations. This book shows that the correction of Maxwell's equations eliminates the infinite zero point energy in quantum electrodynamics. In addition, it presents many more new results.

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- Monopole, Dipole and Multipole Currents
- Hamiltonian Formalism
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- Klein Gordon Equation and Vacuum Constants

Readership Senior undergraduates graduate students researchers and academics in quantum atomic theoretical mathematical and nuclear physics **Advanced Electromagnetism and Vacuum Physics** Patrick Cornille, 2003 This book is aimed at a large audience scientists engineers professors and students wise enough to keep a critical stance whenever confronted with the chilling dogmas of contemporary physics Readers will find a tantalizing amount of material calculated to nurture their thoughts and arouse their suspicion to some degree at least on the so called validity of today's most celebrated physical theories **Extended Electromagnetic Theory** Bo Lehnert, Sisir Roy, 1998 This book presents extended forms of the Maxwell equations as well as electromagnetic fields based on a non zero divergence of the electric field and a non zero electric conductivity in vacuo These approaches which predict new features of the electromagnetic field such as the existence of both longitudinal and transverse solutions the existence of space charge current in vacuo and steady electromagnetic equilibria have possible applications to charge and neutral leptons and new photon physics The present theory can also clear up some unsolved problems such as the total reflection of light at the interface between a vacuum and a dissipative medium and the appearance of an angular momentum of the photon thereby leading to a rest mass and an axial magnetic field component of the photon This axial magnetic field component may be related to the B_3 field proposed by Evans and Vigier A new gauge condition has been proposed to maintain consistency of the theory with the non zero photon mass Several consequences of the non zero mass of the photon are also discussed especially in the astrophysical context

Dynamics of Particles and the Electromagnetic Field Slobodan D. Bosanac, 2005 Accompanying CD ROM includes various illustrative examples *Langevin Equation, The: With Applications To Stochastic Problems In Physics, Chemistry And Electrical Engineering (2nd Edition)* William T Coffey, Yuri P Kalmykov, John T Waldron, 2004-03-03 This volume is the second edition of the first ever elementary book on the Langevin equation method for the solution of problems involving the Brownian motion in a potential with emphasis on modern applications in the natural sciences electrical engineering and so on It has been substantially enlarged to cover in a succinct manner a number of new topics such as anomalous diffusion continuous time random walks stochastic resonance etc which are of major current interest in view of the large number of disparate physical systems exhibiting these phenomena The book has been written in such a way that all the material should be accessible to an advanced undergraduate or beginning graduate student It draws together in a coherent fashion a variety of results which have hitherto been available only in the form of research papers or scattered review articles **Quantum Fluctuations of Spacetime** Lawrence B. Crowell, 2005 Three key aspects of quantum gravity are considered in this book phenomenology potential experimental aspects and foundational theory The phenomenology is the treatment of metric quantum fluctuations as torsional curves that deviate from classical expectations This leads to possible experimental configurations that may detect such fluctuations Most of these proposed experiments are quantum optical measurements of subtle quantum gravity effects in the interaction of photons and atoms The foundational discussions attempt to find an

substratum to string theories which are motivated by the phenomenological treatment Quantum gravity is not the quantization of general relativity but is instead the embedding of quantum theory and gravitation into a more fundamental field theoretic framework

Topological Foundations of Electromagnetism Terence W. Barrett, 2008 Topological Foundations of Electromagnetism seeks a fundamental understanding of the dynamics of electromagnetism and marshals the evidence that in certain precisely defined topological conditions electromagnetic theory Maxwell's theory must be extended or generalized in order to provide an explanation and understanding of until now unusual electromagnetic phenomena Key to this generalization is an understanding of the circumstances under which the so called A potential fields have physical effects Basic to the approach taken is that the topological composition of electromagnetic fields is the fundamental conditioner of the dynamics of these fields The treatment of electromagnetism from first a topological perspective continuing through group theory and gauge theory to a differential calculus description is a major thread of the book Suggestions for potential new technologies based on this new understanding and approach to conditional electromagnetism are also given Sample Chapter s Chapter 1 Electromagnetic Phenomena Not Explained by Maxwell's Equations 260 437 KB Contents Electromagnetic Phenomena Not Explained by Maxwell's Equations The Sagnac Effect A Consequence of Conservation of Action Due to Gauge Field Global Conformal Invariance in a Multiply Joined Topology of Coherent Fields Topological Approaches to Electromagnetism Readership Physicists advanced undergraduate and graduate students in physics electrical engineers

The Langevin Equation William Coffey, Yu. P. Kalmykov, 2012 This volume is the third edition of the first ever elementary book on the Langevin equation method for the solution of problems involving the translational and rotational Brownian motion of particles and spins in a potential highlighting modern applications in physics chemistry electrical engineering and so on In order to improve the presentation to accommodate all the new developments and to appeal to the specialized interests of the various communities involved the book has been extensively rewritten and a very large amount of new material has been added This has been done in order to present a comprehensive overview of the subject emphasizing via a synergetic approach that seemingly unrelated physical problems involving random noise may be described using virtually identical mathematical methods in the spirit of the founders of the subject viz Einstein Langevin Smoluchowski Kramers The book has been written in such a way that all the material should be accessible both to an advanced researcher and a beginning graduate student It draws together in a coherent fashion a variety of results which have hitherto been available only in the form of scattered research papers and review articles

Orbiting The Moons Of Pluto: Complex Solutions To The Einstein, Maxwell, Schrodinger And Dirac Equations Richard L Amoroso, Elizabeth A Rauscher, 2011-03-21 The Maxwell Einstein Schrödinger and Dirac equations are considered the most important equations in all of physics This volume aims to provide new eight and twelve dimensional complex solutions to these equations for the first time in order to reveal their richness and continued importance for advancing fundamental Physics If M Theory is to keep its

promise of defining the ultimate structure of matter and spacetime it is only through the topological configurations of additional dimensionality or degrees of freedom that this will be possible Stretching the exploration of complex space through all of the main equations of Physics should help tighten the noose on the fundamental theory This kind of exploration of higher dimensional spacetime has for the most part been neglected by M theorists and physicists in general and is taken to its penultimate form here Towards a Nonlinear Quantum Physics J. R. Croca,2003 Annotation Presents conceptual and experimental evidence showing that Heisenberg s uncertainty relations are not valid in all cases The results lead to a coherent and beautiful causal synthesis unifying quantum and classical physics

Langevin Equation, The: With Applications To Stochastic Problems In Physics, Chemistry And Electrical Engineering (Fourth Edition) William T Coffey,Yuri P Kalmykov,2017-03-22 Our original objective in writing this book was to demonstrate how the concept of the equation of motion of a Brownian particle the Langevin equation or Newtonian like evolution equation of the random phase space variables describing the motion first formulated by Langevin in 1908 so making him inter alia the founder of the subject of stochastic differential equations may be extended to solve the nonlinear problems arising from the Brownian motion in a potential Such problems appear under various guises in many diverse applications in physics chemistry biology electrical engineering etc However they have been invariably treated following the original approach of Einstein and Smoluchowski via the Fokker Planck equation for the evolution of the probability density function in phase space Thus the more simple direct dynamical approach of Langevin which we use and extend here has been virtually ignored as far as the Brownian motion in a potential is concerned In addition two other considerations have driven us to write this new edition of The Langevin Equation First more than five years have elapsed since the publication of the third edition and following many suggestions and comments of our colleagues and other interested readers it became increasingly evident to us that the book should be revised in order to give a better presentation of the contents In particular several chapters appearing in the third edition have been rewritten so as to provide a more direct appeal to the particular community involved and at the same time to emphasize via a synergetic approach how seemingly unrelated physical problems all involving random noise may be described using virtually identical mathematical methods Secondly in that period many new and exciting developments have occurred in the application of the Langevin equation to Brownian motion Consequently in order to accommodate all these a very large amount of new material has been added so as to present a comprehensive overview of the subject **Langevin Equation, The: With Applications To Stochastic Problems In Physics, Chemistry And Electrical Engineering (3rd Edition)** Yuri P Kalmykov,William T Coffey,2012-07-31 This volume is the third edition of the first ever elementary book on the Langevin equation method for the solution of problems involving the translational and rotational Brownian motion of particles and spins in a potential highlighting modern applications in physics chemistry electrical engineering and so on In order to improve the presentation to accommodate all the new developments and to appeal to the specialized interests of the

various communities involved the book has been extensively rewritten and a very large amount of new material has been added This has been done in order to present a comprehensive overview of the subject emphasizing via a synergetic approach that seemingly unrelated physical problems involving random noise may be described using virtually identical mathematical methods in the spirit of the founders of the subject viz Einstein Langevin Smoluchowski Kramers etc The book has been written in such a way that all the material should be accessible both to an advanced researcher and a beginning graduate student It draws together in a coherent fashion a variety of results which have hitherto been available only in the form of scattered research papers and review articles **Advances in Imaging and Electron Physics** ,2010-11-02

Advances in Imaging and Electron Physics merges two long running serials Advances in Electronics and Electron Physics and Advances in Optical and Electron Microscopy This series features extended articles on the physics of electron devices especially semiconductor devices particle optics at high and low energies microlithography image science and digital image processing electromagnetic wave propagation electron microscopy and the computing methods used in all these domains Contributions from leading international scholars and industry experts Discusses hot topic areas and presents current and future research trends Invaluable reference and guide for physicists engineers and mathematicians **From Photons To**

Atoms: The Electromagnetic Nature Of Matter Daniele Funaro,2019-09-10 Motivated by a revision of the classical equations of electromagnetism that allow for the inclusion of solitary waves in the solution space the material collected in this book examines the consequences of adopting the modified model in the description of atomic structures The possibility of handling photons in a deterministic way indeed gives a chance to review the foundations of quantum physics Atoms and molecules are described as aggregations of nuclei and electrons joined through organized photon layers resonating at various frequencies explaining how matter can absorb or emit light quanta Some established viewpoints are subverted offering an alternative scenario The analysis seeks to provide an answer to many technical problems in physical chemistry and at the same time to raise epistemological questions **Non-diffracting Waves** Hugo E. Hernández-Figueroa, Michel Zamboni-Rached, Erasmo Recami,2013-09-25 This continuation and extension of the successful book Localized Waves by the same editors brings together leading researchers in non diffractive waves to cover the most important results in their field and as such is the first to present the current state The well balanced presentation of theory and experiments guides readers through the background of different types of non diffractive waves their generation propagation and possible applications The authors include a historical account of the development of the field and cover different types of non diffractive waves including Airy waves and realistic finite energy solutions suitable for experimental realization Apart from basic research the concepts explained here have promising applications in a wide range of technologies from wireless communication to acoustics and bio medical imaging **Advances in Imaging and Electron Physics** Henning Harmuth, Beate Meffert,2009-06-12 In this volume the authors extend the calculus of finite differences to Dirac's equation They obtain

solutions for particles with negative mass that are completely equivalent to the solutions with positive mass In addition they obtain solutions for nuclear distances of the order of 10^{-13}m and less rather than for the usual atomic distances They report a number of other deviations from the differential theory for instance they found a slight deviation in the eigenvalues of an electron in a Coulomb field similar to the Lamb shift In two sections some surprising results are shown for the concept of space caused by the replacement of dx by δx **Bridging Circuits and Fields** Alexander I. Petroianu, 2021-11-29

Energy and power are fundamental concepts in electromagnetism and circuit theory as well as in optics signal processing power engineering electrical machines and power electronics However in crossing the disciplinary borders we encounter understanding difficulties due to 1 the many possible mathematical representations of the same physical objects and 2 the many possible physical interpretations of the same mathematical entities The monograph proposes a quantum and a relativistic approach to electromagnetic power theory that is based on recent advances in physics and mathematics The book takes a fresh look at old debates related to the significance of the Poynting theorem and the interpretation of reactive power Reformulated in the mathematical language of geometric algebra the new expression of electromagnetic power reflects the laws of conservation of energy momentum in fields and circuits The monograph offers a mathematically consistent and a physically coherent interpretation of the power concept and of the mechanism of power transmission at the subatomic mesoscopic level The monograph proves paraphrasing Heaviside that there is no finality in the development of a vibrant discipline power theory **General Principles of Quantum Field Theory** N.N. Bogolubov, Anatoly A. Logunov, A.I.

Oksak, I. Todorov, 2012-12-06 The majority of the memorable results of relativistic quantum theory were obtained within the framework of the local quantum field approach The explanation of the basic principles of the local theory and its mathematical structure has left its mark on all modern activity in this area Originally the axiomatic approach arose from attempts to give a mathematical meaning to the quantum field theory of strong interactions of Yukawa type The fields in such a theory are realized by operators in Hilbert space with a positive Poincare invariant scalar product This classical part of the axiomatic approach attained its modern form as far back as the sixties It has retained its importance even to this day in spite of the fact that nowadays the main prospects for the description of the electro weak and strong interactions are in connection with the theory of gauge fields In fact from the point of view of the quark model the theory of strong interactions of Wightman type was obtained by restricting attention to just the physical local operators such as hadronic fields consisting of fundamental quark fields acting in a Hilbert space of physical states In principle there are enough such physical fields for a description of hadronic physics although this means that one must reject the traditional local Lagrangian formalism The connection is restored in the approximation of low energy phenomenological Lagrangians

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