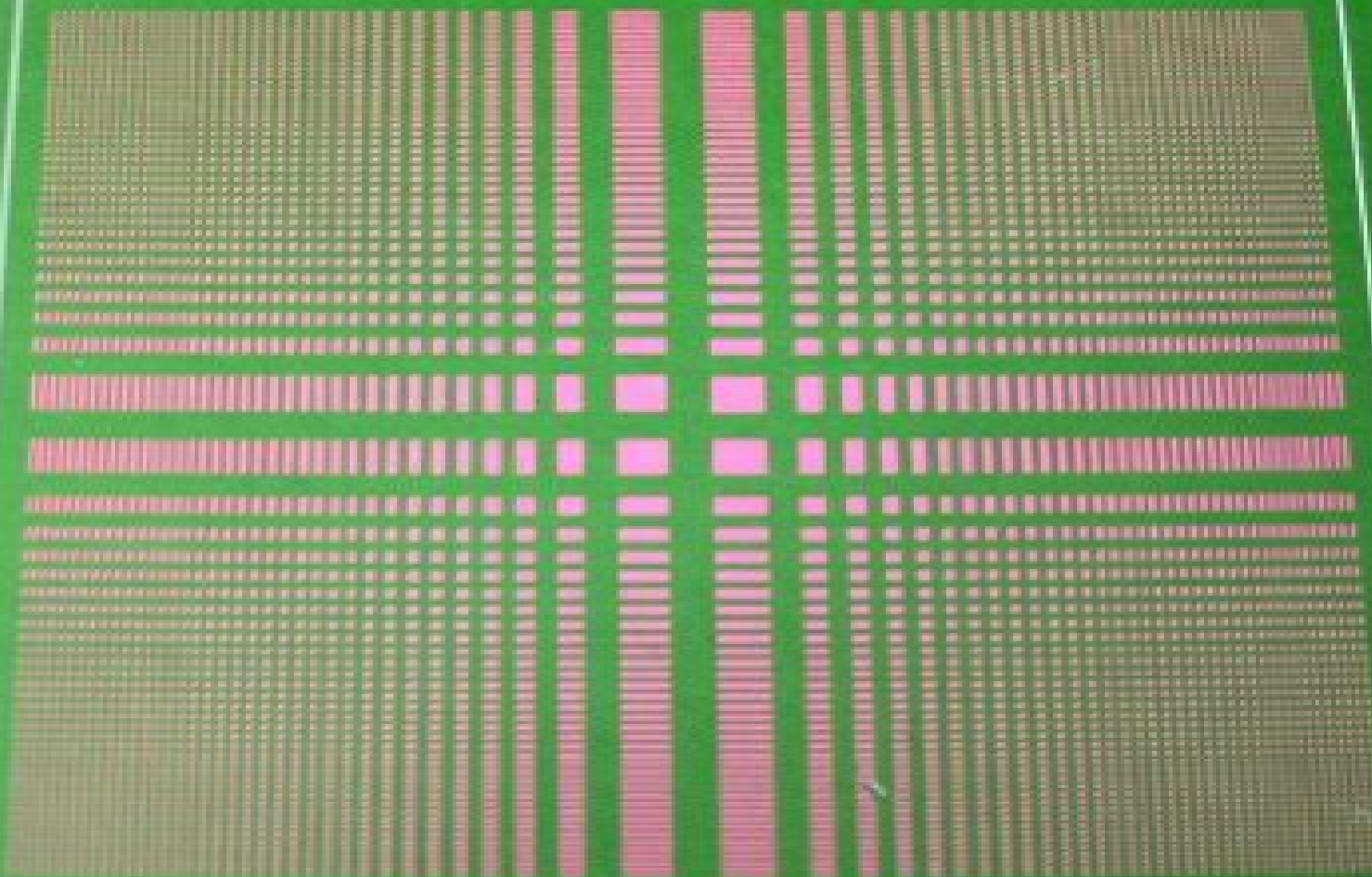


# ELECTROMAGNETIC FIELDS

SOURCES AND MEDIA

Alan M. Portis



# Electromagnetic Fields Sources And Media

**S Baum**



## **Electromagnetic Fields Sources And Media:**

**Electromagnetic Fields Sources and Media** Alan M. Portis, 1981-12-01      **Electromagnetic Sources and**  
**Electromagnetic Fields** Gaobiao Xiao, 2024-01-16 This book presents a modified spherical harmonic expansion method in which the electromagnetic fields and their sources are expanded with the same set of spherical vector basis functions in a similar procedure Explicit expressions for the electromagnetic fields potentials energies and the related Green s functions are derived for the spherical modes in both frequency domain and time domain Based on the formulation the relationships between the electromagnetic sources the electromagnetic far fields and the electromagnetic near fields are clearly revealed In particular a nonuniform transmission line model is developed for intuitively characterizing the total radiation process The introduction of the cutoff radius and the cutoff mode degree provides a simple reference for determining the numbers of degrees of freedom of the fields associated with sources in a bounded region Based on the theory an efficient hybrid method for synthesizing antenna arrays with complex footprints is proposed and demonstrated with several numerical examples Effective algorithms are also developed for reconstructing the radiating part of the current sources This book is intended for researchers engineers and graduate students who are interested in studying the energy transfer in electromagnetic radiation synthesis and measurement of antenna arrays and applications of inverse electromagnetic source problems      Theory and Computation of Electromagnetic Fields in Layered Media Vladimir Okhmatovski, Shucheng Zheng, 2024-04-23 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      Calculation of Electromagnetic

Fields in Multilayer Media Vladimir Nikolaevich Ostreiko, 1989 Translated from the Russian original 1981 Leningrad U Press The purpose of this work is not only to derive rigorous and stable analytic algorithms for calculating the fields in linear multilayer media but to demonstrate the need for a very cautious approach to the monograph that any process in a layered media is unique due to the complexity of its dependence on the geometrical and material properties of the elements of the medium Book club price 59 Annotation copyrighted by Book News Inc Portland OR

**Electromagnetic Fields and Waves** Eugene I. Nefyodov, Sergey M. Smolskiy, 2018-08-27 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

**Behaviour of Electromagnetic Waves in Different Media and Structures** Ali Akdagli, 2011-07-05 This comprehensive volume thoroughly covers wave propagation behaviors and computational techniques for electromagnetic waves in different complex media The chapter authors describe powerful and sophisticated analytic and numerical methods to solve their specific electromagnetic problems for complex media and geometries as well This book will be of interest to electromagnetics and microwave engineers physicists and scientists

**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     *Heterogeneous Media* Sergey Kanaun, 2020-09-25 Heterogeneous Media Local Fields Effective Properties and Wave Propagation outlines new computational methods for solving volume integral equation problems in heterogeneous media The book starts by surveying the various numerical methods of analysis of static and dynamic fields in heterogeneous media listing their strengths and weaknesses before moving onto an introduction of static and dynamic green functions for homogeneous media Volume and surface integral equations for fields in heterogeneous media are discussed next followed by an overview of explicit formulas for numerical calculations of volume and surface potentials The book then segues into Gaussian functions for discretization of volume integral equations for fields in heterogeneous media static problems for a homogeneous host medium with heterogeneous inclusions volume integral equations for scattering problems and concludes with a chapter outlining solutions to homogenization problems and calculations of effective properties of heterogeneous media The book concludes with multiple appendices that feature the texts of basic programs for solving volume integral equations as written in Mathematica Outlines cutting edge computational methods for solving volume integral equation problems in heterogeneous media Provides applied examples of approximation and other methods being employed Demonstrates calculation of composite material properties and the constitutive laws for averaged fields within them Covers static and dynamic 2D and 3D mechanical mathematical models for heterogeneous media     *The Reliable Field Guide To UFO Science, Media And Data Sources* Stephen J. Dirac, 2022-07-29 What makes this UFO book different The Reliable Field Guide to UFO Science Media and Data Sources contains an incredible amount of research and source material including What Proof Is Out there The Various Hypotheses and Phenomena Relevant People Science Experts Programs and Projects Research Organizations Archives Databases and Government Reports 20th To Early 21st Century Researchers Authors and Documentarians Remember if you have been searching for an organized and holistic collection of data on this fascinating and divisive subject The Reliable Field Guide to UFO Science Media and Data Sources is the book you've been searching for Not another UFO Book This book is a complete and comprehensive 548 pages of solid resources and knowledge not just on the subject of UFOs but also a deep dive into the various branches and related concepts such as the Starseed Hypothesis the Sasquatch Bigfoot Phenomenon the Crop Circle Hypothesis the Men In Black Hypothesis and many more Is the TRUTH really out there Exceptional claims require exceptional proofs however and the concept of Unidentified Flying Objects is no longer purely in the realms of science fiction fantasy Recently with the latest improvements in image capturing

and analytical technology and the proliferation of media and data sources we have acquired fantastic amounts of knowledge about the universe but still do not know how much more there is to be discovered As J B S Haldane once said The universe is not only stranger than we imagine it is stranger than we can imagine It is only natural that an intelligent and inquisitive mind fascinated by anomalous experiences should eventually turn its attention to the UFO mystery Whatever your position on UFO s from total believer to a complete skeptic it s always better to arm yourself with the most up to date information on what we currently know what we think we know and the people and personalities behind the theories and explanations of the various phenomena The Reliable Field Guide to UFO Science Media and Data Sources recognizes that the concept of UFO must also incorporate the possibilities of a wider spectrum of Unidentified Anomalous Phenomena UAP and explores these concepts and ideas thoroughly This book takes a wide holistic view of the subject and recognizes that the concept of UFO must also incorporate the possibilities of a wider spectrum of Unidentified Anomalous Phenomena UAP USO Unidentified Submerged Phenomena Psychic Phenomena Paranormal Survival of Consciousness after death Sasquatch Bigfoot Government Black Programs Conspiracies USAP Unacknowledged waived Special Access Programs Breakaway civilization Time Travel Unknown Secret Histories of Humankind Roswell and UFO Crash Retrievals Government Cover ups and Disinformation Programs Remote Viewing Ancient Cultures UFO UAP Hypotheses

Fields, Forces, and Flows in Biological Systems Alan J Grodzinsky, 2011-03-08 Fields Forces and Flows in Biological Systems describes the fundamental driving forces for mass transport electric current and fluid flow as they apply to the biology and biophysics of molecules cells tissues and organs Basic mathematical and engineering tools are presented in the context of biology and physiology The chapters are structured in a framework that moves across length scales from molecules to membranes to tissues Examples throughout the text deal with applications involving specific biological tissues cells and macromolecules In addition a variety of applications focus on sensors actuators diagnostics and microphysical measurement devices e g bioMEMs NEMs microfluidic devices in which transport and electrokinetic interactions are critical This textbook is written for advanced undergraduate and graduate students in biological and biomedical engineering and will be a valuable resource for interdisciplinary researchers including biophysicists physical chemists materials scientists and chemical electrical and mechanical engineers seeking a common language on the subject

**Integral Methods in Low-Frequency Electromagnetics** Pavel Solin, Ivo Dolezel, Pavel Karban, Bohus Ulrych, 2009-08-11 A modern presentation of integral methods in low frequency electromagnetics This book provides state of the art knowledge on integral methods in low frequency electromagnetics Blending theory with numerous examples it introduces key aspects of the integral methods used in engineering as a powerful alternative to PDE based models Readers will get complete coverage of The electromagnetic field and its basic characteristics An overview of solution methods Solutions of electromagnetic fields by integral expressions Integral and integrodifferential methods Indirect solutions of electromagnetic fields by the boundary element method Integral equations in the solution of selected coupled

problems Numerical methods for integral equations All computations presented in the book are done by means of the authors own codes and a significant amount of their own results is included At the book s end they also discuss novel integral techniques of a higher order of accuracy which are representative of the future of this rapidly advancing field Integral Methods in Low Frequency Electromagnetics is of immense interest to members of the electrical engineering and applied mathematics communities ranging from graduate students and PhD candidates to researchers in academia and practitioners in industry

**Electromagnetic Fields in Biological Media: Dosimetry, a primer on bioelectromagnetic. Pt. 2 The SCAT Program, multilayered spheres, theory and applications; Pt. 2 The SCAT Program, multilayered spheres, theory and applications** Stanley M. Neuder,1978 *Electrodynamics of Conducting Dispersive Media* Babak Shokri, Anri A. Rukhadze,2019-12-27

This book presents a sequential representation of the electrodynamics of conducting media with dispersion In addition to the general electrodynamic formalism specific media such as classical nondegenerate plasma degenerate metal plasma magnetoactive anisotropic plasma atomic hydrogen gas semiconductors and molecular crystals are considered The book draws on such classics as *Electrodynamics of plasma and plasma like media* Silin and Rukhadze and *Principles of Plasma Electrodynamics* Alexandrov Bogdankevich and Rukhadze yet its outlook is thoroughly modern both in content and presentation including both classical and quantum approaches It explores such recent topics as surface waves on thin layers of plasma and non dispersive media the permittivity of a monatomic gas with spatial dispersion and current driven instabilities in plasma among many others Each chapter is equipped with a large number of problems with solutions that have academic and practical importance This book will appeal to graduate students as well as researchers and other professionals due to its straight forward yet thorough treatment of electrodynamics in conducting dispersive media

**Introduction to Engineering Electromagnetic Fields** Korada Umashankar,1989 This is a textbook designed to provide analytical background material in the area of Engineering Electromagnetic Fields for the senior level undergraduate and preparatory level graduate electrical engineering students It is also an excellent reference book for researchers in the field of computational electromagnetic fields The textbook covers Static Electric and Magnetic Fields The basic laws governing the Electrostatics Magnetostatics with engineering examples are presented which are enough to understand the fields and the electric current and charge sources Dynamic Electromagnetic Fields The Maxwell s equations in Time Domain and solutions the Maxwell s equations in Frequency Domain and solutions Extensive approaches are presented to solve partial differential equations satisfying electromagnetic boundary value problems Foundation to electromagnetic field radiation guided wave propagation is discussed to expose at the undergraduate level application of the Maxwell s equations to practical engineering problems Handbook of Electromagnetic Propagation in Conducting Media Martin B.

Kraichman,1970 **Electromagnetic Field Near Conducting Half-Space** Yuriy Vasetsky, Artur Zaporozhets,2023-08-11 The book is devoted to the solution of one general problem of the theory of a three dimensional quasi stationary sinusoidal

and pulse electromagnetic field. These studies, unlike many well-known works, are based on obtained exact analytical solution of the problem for the field generated by external current sources near the conducting body with plane surface. The solution for the vector and scalar potentials, electric and magnetic intensities in the dielectric and conducting media is found without restrictions on the configuration of current sources, properties of the media and field frequency. Some general properties of field formation for arbitrary field in the considered system are obtained in particular: full compensation by the field of the electric charge distributed on the interface between the media; the normal component of the induced external electric field and accordingly the equality to zero the components both of the current density and the electric field intensity perpendicular to the interface; the non-uniform electromagnetic field decreases in depth of conducting medium faster than uniform field. It is shown that the exact analytical solution depends on the values of the parameter proportional to the ratio of the field penetration depth to the distance between the external field sources and the body. The concept of strong skin effect is extended to the case of small value of the introduced parameter. A significant simplification of the expressions was obtained as an asymptotic expansion on this small parameter. In the case of pulsed fields, approximate method gives the highest accuracy during important initial period of pulse time. For asymptotic expansion, the approximate impedance boundary condition is generalized to the diffusion of non-uniform field into conducting medium. The book is intended for the researchers, postgraduate students and students specialized in theory and calculations of electromagnetic fields.

**Interactions Between Electromagnetic Field and Moving Conducting Strip** Ihor Kondratenko, Yuriy Vasetsky, Artur Zaporozhets, 2023-11-27. The book combines two interrelated lines of research. One of them is devoted to the development of the theory for solving a certain class of three-dimensional electromagnetic field problems of the three-dimensional electromagnetic field taking into account eddy currents in a moving conducting magnetizing body. Preference is given to the development of the analytical solution methods of the three-dimensional quasi-stationary problem of field conjugation in the system: a contour of an arbitrary spatial configuration with an alternating current is conducting body with a flat boundary surface. The second direction refers to the development of mathematical models for solving applied problems which involve the use of developed methods for calculating the electromagnetic field and their characteristics. The main application of calculation methods is aimed at solving problems of heat treatment of non-ferrous and ferrous metal products using the induction method of heating in a transverse magnetic field. The inverse problems are solved to determine the inductor configuration as flat and spatial current contours for providing the necessary temperature distribution of moving metal strips. To achieve uniform heating of strips across the width using inductors in the form of flat current contours parallel to the strip surface, it is advisable to use combinations of current contours where the geometric dimensions are determined by the size and electro-physical parameters of the metal strips. A more uniform temperature distribution during high-frequency induction heating is achieved by using inductors in the form of current contours of the required spatial configuration. The book is



intended for researchers postgraduate students and students specialized in theory and calculations of electromagnetic fields and induction heating installations *Balanis' Advanced Engineering Electromagnetics* Constantine A. Balanis, 2024-01-31

Balanis Advanced Engineering Electromagnetics The latest edition of the foundational guide to advanced electromagnetics Balanis third edition of Advanced Engineering Electromagnetics a global best seller for over 30 years covers the advanced knowledge engineers involved in electromagnetics need to know particularly as the topic relates to the fast moving continuously evolving and rapidly expanding field of wireless communications The immense interest in wireless communications and the expected increase in wireless communications systems projects antennas microwaves and wireless communications points to an increase in the number of engineers needed to specialize in this field Highlights of the 3rd Edition include A new chapter on Artificial Impedance Surfaces AIS contains material on current and advanced EM technologies including the exciting and fascinating topic of metasurfaces for Control and broadband RCS reduction using checkerboard designs Optimization of antenna fundamental parameters such as input impedance directivity realized gain amplitude radiation pattern Leaky wave antennas using 1 D and 2 D polarization diverse holographic high impedance metasurfaces for antenna radiation control and optimization Associated MATLAB programs for the design of checkerboard metasurfaces for RCS reduction and metasurface printed antennas and holographic L WA for radiation control and optimization Throughout the book there are Additional examples numerous end of chapter problems and PPT notes Fifty three MATLAB computer programs for computations graphical visualizations and animations Nearly 4 500 multicolor PowerPoint slides are available for self study or lecture use *Advanced Engineering Electromagnetics* Constantine A. Balanis, 2012-01-24

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

**Partial Differential Equations and the Finite Element Method** Pavel Šolín, 2005-12-13 A systematic introduction to partial differential equations and modern finite element methods for their efficient numerical solution Partial Differential Equations and the Finite Element Method provides a much needed clear and systematic introduction to modern theory of partial differential equations PDEs and finite element methods FEM Both nodal and hierachic concepts of the FEM are

examined Reflecting the growing complexity and multiscale nature of current engineering and scientific problems the author emphasizes higher order finite element methods such as the spectral or hp FEM A solid introduction to the theory of PDEs and FEM contained in Chapters 1–4 serves as the core and foundation of the publication Chapter 5 is devoted to modern higher order methods for the numerical solution of ordinary differential equations ODEs that arise in the semidiscretization of time dependent PDEs by the Method of Lines MOL Chapter 6 discusses fourth order PDEs rooted in the bending of elastic beams and plates and approximates their solution by means of higher order Hermite and Argyris elements Finally Chapter 7 introduces the reader to various PDEs governing computational electromagnetics and describes their finite element approximation including modern higher order edge elements for Maxwell's equations The understanding of many theoretical and practical aspects of both PDEs and FEM requires a solid knowledge of linear algebra and elementary functional analysis such as functions and linear operators in the Lebesgue Hilbert and Sobolev spaces These topics are discussed with the help of many illustrative examples in Appendix A which is provided as a service for those readers who need to gain the necessary background or require a refresher tutorial Appendix B presents several finite element computations rooted in practical engineering problems and demonstrates the benefits of using higher order FEM Numerous finite element algorithms are written out in detail alongside implementation discussions Exercises including many that involve programming the FEM are designed to assist the reader in solving typical problems in engineering and science Specifically designed as a coursebook this student tested publication is geared to upper level undergraduates and graduate students in all disciplines of computational engineering and science It is also a practical problem solving reference for researchers engineers and physicists

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