Beam Wave Interaction In Periodic And Quasi Periodic Structures Particle Acceleration And Detection

TV & Video Engineer's Reference Book presents an extensive examination of the basic television standards and broadcasting spectrum. It discusses the fundamental concepts in analogue and digital circuit theory. It addresses studies in the engineering mathematics, formulas, and calculations. Some of the topics covered in the book are the conductors and insulators, passive components, alternating current circuits; broadcast transmission; radio frequency propagation; electron optics in cathode ray tube; color encoding and decoding systems; television transmitters; and remote supervision of unattended transmitters. The definition and description of diagnostics in computer controlled equipment are fully covered. In-depth accounts of the microwave radio relay systems are provided. The general characteristics of studio lighting and control are completely presented. A chapter is devoted to video tape recording. Another section focuses on the mixers and special effects generators. The book can provide useful information to technicians, engineers, students, and researchers.

The first edition of High Power Microwaves was considered to be the defining book for this field. Not merely updated but completely revised and rewritten, the second edition continues this tradition. Written from a systems perspective, the book provides a unified, coherent presentation of the fundamentals in this rapidly changing field. The p

Praise for the 1st Edition: "well written and up to date.... The problem sets at the end of each chapter reinforce and enhance the material presented, and may give students

confidence in handling real-world problems." ?Optics & Photonics News "rigorous but simple description of a difficult field keeps the reader's attention throughout.... serves perfectly for an introductory-level course." ?Physics Today This fully revised introduction enables the reader to understand and use the basic principles related to many phenomena in nonlinear optics and provides the mathematical tools necessary to solve application-relevant problems. The book is a pedagogical guide aimed at a diverse audience including engineers, physicists, and chemists who want a tiered approach to understanding nonlinear optics. The material is augmented by numerous problems, with many requiring the reader to perform real-world calculations for a range of fields, from optical communications to remote sensing and quantum information. Analytical solutions of equations are covered in detail and numerical approaches to solving problems are explained and demonstrated. The second edition expands the earlier treatment and includes: A new chapter on quantum nonlinear optics. Thorough treatment of parametric optical processes covering birefringence, tolerances and beam optimization to design and build high conversion efficiency devices. Treatment of numerical methods to solving sets of complex nonlinear equations. Many problems in each chapter to challenge reader comprehension. Extended treatment of four-wave mixing and solitons. Coverage of ultrafast pulse propagation including walk-off effects.

The book presents results of a comprehensive study of various features of eigen electromagnetic waves propagating across the axis of plasma filled metal waveguides with cylindrical geometry. The authors collected in one book material on various features of surface flute waves, i.e. impact of waveguide design on wave dispersion, wave damping influenced by various reasons, impact of plasma density and

external magnetic field inhomogeneity on the wave, and impact of waveguide corrugation and electric current on the wave. A variety of present surface waves applications and possible future applications is also included. Using the method of successive approximations it is shown how one can solve problems, which concern real experimental devices, starting from simple models. The book applies to both professionals dealing with problems of confined plasmas and to graduate and post-graduate students specializing in the field of plasma physics and related applications.

Crossed-field Microwave Devices, Volume II: Principal Types of Crossed-Field Devices, Analysis of Oscillator System Performance, Regional Progress and Trends focuses on the progress and state of the art crossed-field microwave devices in theory and practice. The selection first offers information on injection type tubes and voltage tuned oscillators. Discussions focus on the principle of the injection type traveling wave tubes, delay lines, resistive wall amplifier, space-charge effects, and grid control of magnetrons. The text then takes a look at mechanically tuned oscillators and wide band and externally stabilized tunable oscillators. The publication examines fixed frequency magnetron oscillators and phasing by RF signals. Topics include conventional pulsed rising-sun magnetrons, long anode magnetrons, inverted magnetrons, eccentricity of the cathode in magnetrons, mutual synchronization, and modulation using phased oscillators. Frequency pushing, loading effects, and frequency modulation are also discussed. The selection is a vital reference for readers interested in crossed-field microwave devices.

Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

Systems driven far from thermodynamic equilibrium can create dissipative structures through the spontaneous breaking of symmetries. A particularly fascinating feature of these pattern-forming systems is their tendency to produce spatially confined states. These localized wave packets can exist as propagating entities through space and/or time. Various examples of such systems will be dealt with in this book, including localized states in fluids, chemical reactions on surfaces, neural networks, optical systems, granular systems, population models, and Bose-Einstein condensates. This book should appeal to all physicists, mathematicians and electrical engineers interested in localization in far-from-equilibrium systems. The authors - all recognized experts in their fields - strive to achieve a balance between theoretical and experimental considerations thereby giving an overview of fascinating physical principles, their manifestations in diverse systems, and the novel technical applications on the horizon.

A gyrotron traveling-wave amplifier (gyro-TWT) with the high-power and broad-band capabilities is considered as a turn-on key for next generation high-resolution radar. The book presents the most advanced theory, methods and physics in a gyro-TWT. The most challenging problem of instability competition has been for the first time addressed in a focused and systematic way and reported via concise states and vivid pictures. The book is likely to meet the interest of researchers and engineers in radar and microwave technology, who would like to study the gyro-TWTs and to promote its application in millimeter-wave radars. Chao-Hai Du and

Pu-Kun Liu are both professors at Peking University. Hierarchic Electrodynamics and Free Electron Lasers: Concepts, Calculations, and Practical Applications presents intriguing new fundamental concepts in the phenomenon of hierarchical electrodynamics as a new direction in physics. Concentrating on the key theory of hierarchic oscillations and waves, this book focuses on the numerous applications of nonlinear theory in different types of high-current Free Electron Lasers (FEL), including their primary function in the calculation methods used to analyze various multi-resonant, multi-frequency nonlinear FEL models. This is considered the first book to: Completely and systematically describe the foundation of hierarchical electrodynamics as a new direction of physics Fully represent the physics of high-current FEL—and associated models—from the hierarchic oscillation wave perspective Cover the multi-harmonic nonlinear theory of new types of electronic devices, such as plasma-beam and two-stream FEL Formulate and substantiate the concept of cluster femtosecond FEL Analyze practical prospects for a new generation of a global "Star Wars" strategic defense systems These subjects involve a wide range of disciplines. Using numerous real-world examples to illustrate information and concepts, the book offers a mathematical foundation to explore FEL applications as well as analyze hierarchic plasma-like electrodynamic systems and femto-second clusters of electromagnetic energy. Assembling fragmented concepts from existing literature, the author re-examines classic approaches in order to develop new insights and achieve scientific breakthroughs.

Beam-Wave Interaction in Periodic and Quasi-Periodic StructuresSpringer

This book is divided into two parts. The first part deals with basic electromagnetic and the second part with beam-wave electronics related to growing-wave devices including 'slow-wave' travelling-wave tubes and 'fast-wave' gyro-travelling-wave tubes. The first part is a prerequisite for the second part, while the second part covers the applications of the topics discussed in the first part. These two parts put together make the volume a self-contained treatise. In the specific applications considered, time-independent field concepts are exemplified in the problems related to the formation of an electron beam by an electron gun, the confinement of an electron beam by a magnetic focusing structure, etc. Similarly, time-dependent field concepts are exemplified in problems related to propagation through a slow-wave structure and amplification in growing-wave electron beam devices, such as travelling-wave tubes, double-stream amplifiers, beam-plasma amplifiers and gyro-travelling-wave tubes. All throughout the text, stress is given to provide complete analytical deductions with full mathematical details and present the state-of-the-art concepts.

This BriefBook is a much extended glossary or a much condensed handbook, depending on the way one looks at it. In encyclopedic format, it covers subjects in statistics, computing, analysis, and related fields, resulting in a book that is both an introduction and a reference for scientists and engineers, especially experimental physicists dealing with data analysis.

The current and definitive reference broadcast engineers need! Compiled by leading international experts, this authoritative reference work covers every aspect of broadcast technology from camera to transmitter - encompassing subjects from analogue techniques to the latest digital compression and interactive technologies in a single source. Written with a minimum of maths, the book provides detailed coverage and quick access to key technologies, standards and practices. This global work will become your number one resource whether you are from an audio, video, communications or computing background. Composed for the industry professional, practicing engineer, technician or sales person looking for a guide that covers the broad landscape of television technology in one handy source, the Broadcast Engineer's Reference Book offers comprehensive and accurate technical information. Get this wealth of information at your fingertips! · Utilize extensive illustrations-more than 1200 tables, charts and photographs. · Find easy access to essential technical and standards data. · Discover information on every aspect of television technology. · Learn the concepts and terms every broadcaster needs to know. Learn from the experts on the following technologies: Quantities and Units; Error Correction; Network Technologies; Telco Technologies; Displays; Colourimetry; Audio Systems; Television Standards; Colour encoding; Time code; VBI data carriage; Broadcast Interconnect formats; File storage formats; HDTV; MPEG 2; DVB; Data Broadcast; ATSC Interactive TV; encryption systems; Optical systems; Studio Cameras and camcorders; VTRs and

Tape Storage; Standards Convertors; TV Studios and Studio Equipment; Studio Lighting and Control; post production systems; Telecines; HDTV production systems; Media Asset Management systems; Electronic News Production Systems; OB vehicles and Mobile Control Rooms;ENG and EFP; Power and Battery Systems; R.F. propagation; Service Area Planning; Masts Towers and Antennas; Test and measurement; Systems management; and many more! Related Focal Press titles: Watkinson: Convergence In Broadcast and Communications Media (2001, £59.99 (GBP)/ $75.95 (USD), ISBN: 0240515099) Watkinson: MPEG Handbook (2001, £35 (GBP)/$54.99 (USD) ISBN: 0240516567)

Advances in Electronics and Electron Physics

An advanced course of classical electrodynamics with application to the generation of high-power coherent radiation in the microwave to optical-wave regions. Specifically, it provides readers with the basics of advanced electromagnetic theory and relativistic electrodynamics, guiding them step by step through the theory of free-electron lasers. The theoretical treatment throughout this book is fully developed by means of the usual three-dimensional vector calculus.

The interaction of transverse electron beam waves with external electromagnetic fields, and the application of this interaction in microwave devices are discussed. In particular, problems involving various aspects of the so-called DCpumped electron beam amplifiers were analysed. Interaction problems in the pump field wereANALYSED BOTH THEORETICALLY AND

EXPERIMENTALLY. Considerable attention was devoted to problems of noise theory, a d an expression for the minimum noi e temperature of DC-pumped amplifiers was derived. Research on the problem of designing suitable periodic structures for the input- and output-couplers of transverse field devices was performed. The theory of a harmonic generator based on cyclotron waves was presented. Three tubes were designed and tested. Two of them were cyclotron-wave amplifiers, and the third a synchronous-wave amplifier. They all worked in satisfactory agreement with theory. (Author).

This BriefBook is a much extended glossary or a much condensed handbook, depending on the way one looks at it. It deals with detectors in particle and nuclear physics experiments. The authors describe, in encyclopedic format, the physics, the application, and the analysis of data from these detectors. Ample reference is made to the published literature. An introduction for newcomers, a reference for scientists.

The main theme of this book is the interaction of electrons with electromagnetic waves in the presence of periodic and quasi-periodic structures in vacuum, in view of applications in the design and operation of particle accelerators. The first part of the book is concerned with the textbook-like presentation of the basic material, in particular reviewing elementary electromagnetic phenomena and electron dynamics. The second part of the book describes the current models for beam-wave interactions with periodic and quasi-periodic structures. This is the basis for introducing, in the last part of the

book, a number of particle and radiation sources that rest on these principles, in particular the free-electron laser, wake-field acceleration schemes and a number of other advanced particle accelerator concepts. This second edition brings this fundamental text up-to-date in view of the enormous advances that have been made over the last decade since the first edition was published. All chapters, as well as the bibliography, have been significantly revised and extended, and the number of end-of-chapter exercises has been further increased to enhance this book's usefulness for teaching specialized graduate courses.

"Nature performs not hing vainly, and makes nothing unnecessary" Aristotle Interest in the passage of charged particles through crystals first appeared at the beginning of this century following experiments on x-ray diffraction in crystallattices, which provided the proof of an ordered distribution of atoms in a crystal. Stark [1] put forward the hypothesis that certain directions in a crystal should be relatively transparent to charged particles. These first ideas on the channeling of charged particles in crystals were forgotten but became topical again in the early 1960s when the channeling effect was rediscovered by computer simulation [2] and in experiments [3] that revealed anomalously long ion ranges in crystals. The orientational ef fects during the passage of charged particles through crystals have been found for a whole range of processes characterized by small impact parameters for

collisions between particles and atoms: nuclear reactions, large-angle scatter ing, energy losses. Lindhard explained the channeling of charged particles in crystals [4]. The results of the numerous investigations into the channeling of low-energy (amounting to several MeV) charged particles in crystals have been summarized in several monographs and reviews [5~8l.

Ch. 1. Linear harmonic waves in dispersive systems. Initial-value problem and problem with an external source. 1. Harmonic waves in dispersive systems. 2. Initial-value problem. Eigenmode method. 3. Characteristic function of the state vector. Dispersion operator. 4. Laplace transform method -- ch. 2. A case study of linear waves in dispersive media. 5. Transverse electromagnetic waves in an isotropic dielectric. 6. Longitudinal electrostatic waves in a cold isotropic plasma. Collisional dissipation of plasma waves. 7. Transverse electromagnetic waves in a cold isotropic plasma. Dissipation of transverse waves in a plasma. 8. Electromagnetic waves in metals. 9. Electromagnetic waves in a waveguide with an isotropic dielectric. 10. Longitudinal waves in a hot isotropic plasma. Electron diffusion in a plasma. 11. Longitudinal waves in an isotropic degenerate plasma. Waves in a quantum plasma. 12. Ion acoustic waves in a nonisothermal plasma. Ambipolar diffusion. 13. Electromagnetic waves in a waveguide with an anisotropic plasma in a strong

external magnetic field. 14. Electromagnetic waves propagating in a magnetized electron plasma along a magnetic field. 15. Electrostatic waves propagating in a magnetized electron plasma at an angle to a magnetic field. 16. Magnetohydrodynamic waves in a conducting fluid. 17. Acoustic waves in crystals. 18. Longitudinal electrostatic waves in a one-dimensional electron beam. 19. Beam instability in a plasma. 20. Instability of a current-carrying plasma -- ch. 3. Linear waves in coupled media. Slow amplitude method. 21. Coupled oscillator representation and slow amplitude method. 22. Beam-plasma system in the coupled oscillator representation. 23. Basic equations of microwave electronics. 24. Resonant Buneman instability in a current-carrying plasma in the coupled oscillator representation. 25. Dispersion function and wave absorption in dissipative systems. 26. Some effects in the interaction between waves in coupled systems. 27. Waves and their interaction in periodic structures -- ch. 4. Nonharmonic waves in dispersive media. 28. General solution to the initial-value problem. 29. Quasi-harmonic approximation. Group velocity. 30. Pulse spreading in equilibrium dispersive media. 31. Stationary-phase method. 32. Some problems for wave equations with a source -- ch. 5. Nonharmonic waves in nonequilibrium media. 33. Pulse propagation in nonequilibrium media. 34. Stationary-phase method for complex frequencies.

35. Quasi-harmonic approximation in the theory of interaction of electron beams with slowing-down media -- ch. 6. Theory of instabilities. 36. Convective and absolute instabilities. First criterion for the type of instability. 37. Saddle-point method. Second criterion for the type of instability. 38. Third Criterion for the type of instability. 39. Type of beam instability in the interaction with a slowed wave of zero group velocity in a medium. 40. Calculation of the Green's functions of unstable systems -- ch. 7. Hamiltonian method in the theory of electromagnetic radiation in dispersive media. 41. Equations for the excitation of transverse electromagnetic field oscillators. 42. Dipole radiation. 43. Radiation from a moving dipole - undulator radiation. 44. Cyclotron radiation. 45. Cherenkov effect. Anomalous and normal doppler effects. 46. Application of the Hamiltonian method to the problem of the excitation of longitudinal waves Volume 2 of the book begins with chapter 6, in which we have taken up conventional MWTs (such as TWTs, klystrons, including multi-cavity and multi-beam klystrons, klystron variants including reflex klystron, IOT, EIK, EIO and twystron, and crossed-field tubes, namely, magnetron, CFA and carcinotron). In chapter 7, we have taken up fast-wave tubes (such as gyrotron, gyro-BWO, gyro-klystron, gyro-TWT, CARM, SWCA, hybrid gyro-tubes and peniotron). In chapter 8, we discuss vacuum microelectronic tubes (such as klystrino

module, THz gyrotron and clinotron BWO); plasma-assisted tubes (such as PWT, plasma-filled TWT, BWO, including PASOTRON, and gyrotron); and HPM (high power microwave) tubes (such as relativistic TWT, relativistic BWO, RELTRON (variant of relativistic klystron), relativistic magnetron, high power Cerenkov tubes including SWO, RDG or orotron, MWCG and MWDG, bremsstrahlung radiation type tube, namely, vircator, and M-type tube MILO). In Chapter 9, we provide handy information about the frequency and power ranges of common MWTs, although more such information is provided at relevant places in the rest of the book as and where necessary. Chapter 10 is an epilogue that sums up the authors' attempt to bring out the various aspects of the basics of and trends in high power MWTs.

During the past seven years I have been involved in the investigation of high power microwave sources for accelerator and radar applications. As for many others before me, the starting point of this book was a collection of notes on theoretical topics out of the material I had been working on. The notes were the core of a course for graduate students at Cornell University. When I started to prepare these notes it seemed a fairly straight-forward and not very time-consuming task since I had most of the material well organized. Today, three years after the preparation of the first notes, I can only wonder how naive this

thought was. Most of my work was oriented towards analytic and quasi-analytic tech niques for the investigation of the interaction of an electron beam with elec tromagnetic waves. These topics are presented in Chaps. 4 and 6. However, for a systematic elaboration of these topics it was necessary to provide some general background, therefore parts of what are today Chaps. 2, 3, and 5 were prepared. Related topics of acceleration concepts were also prepared to some extent but I ran out of time and the material (Chap. 8) was not delivered. In the meantime, various sections of this book were taught at the Technion Israel Institute of Technology and Ben-Gurion University. In the last version I included a discussion on free electron lasers (Chap. 7).

The interaction between transverse electron beam waves in periodic fields is usually analyzed by assuming a sinusoidal variation of the electric and magnetic fields. In this analysis another approach is used, assuming the fields to consist of functions. Exact solutions can then be obtained by standard mathematical methods. The interaction in quadrupole fields, two-dimensional fields, and fields of rotational symmetry is considered, and the results are shown to agree well with the sinusoidal-field theory. Extensive numerical calculations are presented. (Author).

Advances in Microwaves, Volume 6 is a three-

chapter text that explores the fundamental principles of precision coaxial connectors, traveling wave tubes, and junction circulators. Chapter 1 discusses the significant developments in the design, accuracy, and reference standard lines of precision coaxial connectors, with an emphasis on the application of the 7-mm and 14-mm precision coaxial connectors. Chapter 2 examines the stability of strongly modulated beams in a variety of focusing systems, such as uniform magnetic fields (Brillouin and near-Brillouin flow), linearly tapered magnetic fields, and periodic-permanent-magnet field systems. Chapter 3 deals with the theoretical aspects and characteristics of all types of junction circulators, with an emphasis on the lumped-element and the stripline circulator. Discussions on a theorem on passive three-port networks and star and delta networks are covered in the supplementary texts.

Nineteen experts from the electronics industry, research institutes and universities have joined forces to prepare this book. It does nothing less than provide a complete overview of the electrophysical fundamentals, the present state of the art and applications, as well as the future prospects of microwave tubes and systems. The book does the same for optoelectronics vacuum devices, electron and ion beam devices, light and X-ray emitters, particle accelerators and vacuum interrupters.

Get up-to-speed on the theory, principles and design

of vacuum electron devices.
Free Electron Lasers consists of 10 chapters, which refer to fundamentals and design of various free electron laser systems, from the infrared to the xuv wavelength regimes. In addition to making a comparison with conventional lasers, a couple of special topics concerning near-field and cavity electrodynamics, compact and table-top arrangements and strong radiation induced exotic states of matter are analyzed as well. The control and diagnostics of such devices and radiation safety issues are also discussed. Free Electron Lasers provides a selection of research results on these special sources of radiation, concerning basic principles, applications and some interesting new ideas of current interest.
Nonlinear Electron-Wave Interaction Phenomena explores the interaction between drifting streams of charged particles and propagating electromagnetic waves. Of particular concern are the situations in which the wave amplitude is large and there is strong coupling between the charged fluid and the wave. Emphasis is placed on those devices that utilize a defined injected stream of some type. Particle and electromagnetic wave velocities both small and comparable to the velocity of light are considered. Comprised of 16 chapters, this book begins with an introduction to the various classes of devices in which the drifting stream (charged fluid) is

composed of electrons and/or ions coupled to a slow electromagnetic wave over an extended region. The discussion then turns to Eulerian versus Lagrangian formulation and radio-frequency equivalent circuits, along with space-charge-field expressions. Subsequent chapters focus on the interaction mechanisms in klystrons, traveling-wave amplifiers, and O-type backward-wave oscillators, as well as crossed-field forward- and backward-wave amplifiers, and traveling-wave energy converters. The book also evaluates multibeam and beam-plasma interactions; phase focusing of electron bunches; pre-bunched electron beams; collector depression techniques; and modulation characteristics. This monograph is designed to serve both as a research monograph for workers in the fields of microwave electron and plasma devices and as a text for advanced graduate students.