



Peter Hawkes • Erwin Kasper

Principles of Electron Optics

Volume Two: Applied Geometrical Optics

Second Edition



Principles Of Electron Optics Applied Geometrical Optics Principles Of Electron Optics

**Mykhailo Ilchenko, Leonid
Uryvsky, Larysa Globa**



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Principles of Electron Optics, Volume 2 Peter W. Hawkes, Erwin Kasper, 2017-12-13 Principles of Electron Optics Applied Geometrical Optics Second Edition gives detailed information about the many optical elements that use the theory presented in Volume 1 electrostatic and magnetic lenses quadrupoles cathode lens based instruments including the new ultrafast microscopes low energy electron microscopes and photoemission electron microscopes and the mirrors found in their systems Wien filters and deflectors The chapter on aberration correction is largely new The long section on electron guns describes recent theories and covers multi column systems and carbon nanotube emitters Monochromators are included in the section on curved axis systems The lists of references include many articles that will enable the reader to go deeper into the subjects discussed in the text The book is intended for postgraduate students and teachers in physics and electron optics as well as researchers and scientists in academia and industry working in the field of electron optics electron and ion microscopy and nanolithography Offers a fully revised and expanded new edition based on the latest research developments in electron optics Written by the top experts in the field Covers every significant advance in electron optics since the subject originated Contains exceptionally complete and carefully selected references and notes Serves both as a reference and text

Principles of Electron Optics Peter W. Hawkes, Erwin Kasper, 1996-04-24 Principles of Electron Optics Principles of Electron Optics, Volume 1 Peter W. Hawkes, Erwin Kasper, 2017-10-29 Volume one of Principles of Electron Optics Basic Geometrical Optics Second Edition explores the geometrical optics needed to analyze an extremely wide range of instruments cathode ray tubes the family of electron microscopes including the fixed beam and scanning transmission instruments the scanning electron microscope and the emission microscope electron spectrometers and mass spectrograph image converters electron interferometers and diffraction devices electron welding machines and electron beam lithography devices The book provides a self contained detailed modern account of electron optics for anyone involved with particle beams of modest current density in the energy range up to a few mega electronvolts You will find all the basic equations with their derivations recent ideas concerning aberration studies extensive discussion of the numerical methods needed to calculate the properties of specific systems and guidance to the literature of all the topics covered A continuation of these topics can be found in volume two Principles of Electron Optics Applied Geometrical Optics The book is intended for postgraduate students and teachers in physics and electron optics as well as researchers and scientists in academia and industry working in the field of electron optics electron and ion microscopy and nanolithography Offers a fully revised and expanded new edition based on the latest research developments in electron optics Written by the top experts in the field Covers every significant advance in electron optics since the subject originated Contains exceptionally complete and carefully selected references and notes Serves both as a reference and text *Principles of Electron Optics* Peter W. Hawkes, Erwin Kasper, 1989-01-28 This volume and the second see following entry are two of a three part textbook and source

book v 3 is not yet published The fundamentals are set out in detail for students seeking to master basic ideas or to begin the analysis of some class of systems not yet explored Principal electron opti

Principles of Electron Optics: Basic geometrical optics P. W. Hawkes,Erwin Kasper,1989 This is a complete handbook and reference volume which covers everything that one needs to know about electron optics It is a comprehensive coverage of theoretical background and modern computing methods It contains a detailed and unique account of numerical methods and an extensive bibliography

Principles of Electron Optics, Volume 3 Peter W. Hawkes,Erwin Kasper,2022-02-21 Principles of Electron Optic Volume Three Wave Optics discusses this essential topic in microscopy to help readers understand the propagation of electrons from the source to the specimen and through the latter and from it to the image plane of the instrument In addition it also explains interference phenomena notably holography and informal coherence theory This third volume accompanies volumes one and two that cover new content on holography and interference improved and new modes of image formation aberration corrected imaging simulation and measurement 3D reconstruction and more The study of such beams forms the subject of electron optics which divides naturally into geometrical optics where effects due to wavelength are neglected with wave optics considered Includes authoritative coverage of the fundamental theory behind electron beams Describes the interaction of electrons with solids and the information that can be obtained from electron beam techniques Addresses recent relevant research topics including new content on holography and interference new modes of image formation 3D reconstruction and aberration corrected imaging simulation and measurement

Principles of Electron Optics Peter W. Hawkes,Erwin Kasper,2012-12-02 This is a complete handbook and reference volume which covers everything that one needs to know about electron optics It is a comprehensive coverage of theoretical background and modern computing methods It contains a detailed and unique account of numerical methods and an extensive bibliography

Principles of Electron Optics P. W. Hawkes,E. Kasper,Erwin Kasper,1996 *Advanced Computing in Electron Microscopy* Earl J. Kirkland,2020-03-09 This updated and revised edition of a classic work provides a summary of methods for numerical computation of high resolution conventional and scanning transmission electron microscope images At the limits of resolution image artifacts due to the instrument and the specimen interaction can complicate image interpretation Image calculations can help the user to interpret and understand high resolution information in recorded electron micrographs The book contains expanded sections on aberration correction including a detailed discussion of higher order multipole aberrations and their effect on high resolution imaging new imaging modes such as ABF annular bright field and the latest developments in parallel processing using GPUs graphic processing units as well as updated references Beginning and experienced users at the advanced undergraduate or graduate level will find the book to be a unique and essential guide to the theory and methods of computation in electron microscopy

Advances in Imaging and Electron Physics Peter W. Hawkes,2003-12-02 The subjects reviewed in the Advances series cover a broad range of themes including microscopy

electromagnetic fields and image coding Volume 128 concentrates on regularization a vital aspect of restoration on low voltage scanning electron microscopy This Book looks at theory and its application in a practical sense with a full account of the methods used and realistic detailed application The authors do this by examining the latest developments historic illustrations and mathematical fundamentals of the exciting developments in imaging and applying them to realistic practical situations The text bridges the gap between academic researchers and R D designers by addressing and solving daily issues which makes this book essential reading Emphasizes broad and in depth article collaborations between world renowned scientists in the field of image and electron physics Presents theory and its application in a practical sense providing long awaited solutions and new findings Bridges the gap between academic researchers and practitioners in industry Electron Microscopy of Polymers Goerg H. Michler, 2008-07-05 The study of polymers by electron microscopy EM needs special techniques precautions and preparation methods including ultramicrotomy General characteristics of the different techniques of EM including scanning force microscopy are given in this hands on book The application of these techniques to the study of morphology and properties particularly micromechanical properties is described in detail Examples from all classes of polymers are presented **Handbook of Charged Particle Optics** Jon Orloff, 2017-12-19 With the growing proliferation of nanotechnologies powerful imaging technologies are being developed to operate at the sub nanometer scale The newest edition of a bestseller the Handbook of Charged Particle Optics Second Edition provides essential background information for the design and operation of high resolution focused probe instruments The book's unique approach covers both the theoretical and practical knowledge of high resolution probe forming instruments The second edition features new chapters on aberration correction and applications of gas phase field ionization sources With the inclusion of additional references to past and present work in the field this second edition offers perfectly calibrated coverage of the field's cutting edge technologies with added insight into how they work Written by the leading research scientists the second edition of the Handbook of Charged Particle Optics is a complete guide to understanding designing and using high resolution probe instrumentation **Quantum Mechanics of Charged Particle Beam Optics** Ramaswamy Jagannathan, Sameen Ahmed Khan, 2019-05-20 Classical Charged Particle Beam Optics used in the design and operation of all present day charged particle beam devices from low energy electron microscopes to high energy particle accelerators is entirely based on classical mechanics A question of curiosity is How is classical charged particle beam optics so successful in practice though the particles of the beam like electrons are quantum mechanical Quantum Mechanics of Charged Particle Beam Optics answers this question with a comprehensive formulation of Quantum Charged Particle Beam Optics applicable to any charged particle beam device **Advanced Smart Information and Communication Technology and Systems** Mykhailo Ilchenko, Leonid Uryvsky, Larysa Globa, 2025-07-28 This book highlights the most important research areas in Information and Communication Technologies and their impact on digital society and environment sustainable development namely the

research in fields of Information and Communication Technologies artificial intelligence in ICT lunar missions maintenance security of data and services smart robotic systems implementation in the digital environment and mathematical modeling for practical and research tasks in communication and data processing fields provided by various groups of researchers from Germany and Ukraine in cooperation with scientists from different countries The presented studies contain a discussion on the use of multi cloud integration approaches in particular based on methods of deep learning practical implementation of the Internet of Things IoT the modern study of V2V Communication and research in fields of mathematical modeling in applied problems The book focuses on the basics of information and analytical activities in the digital global space to providing broadband Internet access without decreasing the quality of experience QoE level improving services provision and system architecture with improving security The study of modern communication and information technologies contains original works dealing with many aspects of their improvement and use for research that shows some effective technological solutions that can be used for the implementation of novel cloud infrastructure and radio electronics systems These results can be used in the implementation of novel systems and to promote the exchange of information in e societies Given its scope the book offers a valuable resource for scientists lecturers specialists working at enterprises and graduate and

undergraduate students who engage with problems in Information and Communication Technologies as well as aspects of society and environment sustainable development **Atomic-Scale Analytical Tomography** Thomas F. Kelly, Brian P. Gorman, Simon P. Ringer, 2022-03-24 A comprehensive guide on Atomic Scale Analytical Tomography ASAT that discusses basic concepts and implications of the technique in areas such as material sciences microscopy engineering sciences and several interdisciplinary avenues The title interrogates how to successfully achieve ASAT at the intersection of transmission electron microscopy and atom probe microscopy This novel concept is capable of identifying individual atoms in large volumes as well as in 3D with high spatial resolution Written by leading experts from academia and industry this book serves as a guide with real world applications on cutting edge research problems An essential reading for researchers engineers and practitioners interested in nanoscale characterisation this book introduces the reader to a new direction for atomic scale microscopy

Networks and Sustainability Andriy Luntovskyy, Mikhaïlo Klymash, Igor Melnyk, Mykola Beshley, Dietbert Gütter, 2025-09-30 This book explores advanced networking topics building on previous Springer books like Intent based Networking 2022 Emerging Networking in the Digital Transformation Age 2023 and Digital Ecosystems 2024 It merges network technologies with sustainable development energy efficiency AI and smart apps Topics include LLMs ML large scale distributed networks QoS IoT with cloud and fog ecosystems smart grids and robotics It emphasizes the synergy of smart apps AI and computational intelligence The book shows how advanced networks support sustainability energy efficiency and inclusiveness focusing on data science cybersecurity user intentions and cost reduction addressing key aspects like reliability privacy inclusiveness and accessibility Suitable for students professors and lecturers in networking distributed systems

cybersecurity data science and AI it also serves as a research base and source of inspiration for professionals seeking new challenges

Transmission Electron Microscopy Ludwig Reimer, Helmut Kohl, 2008-12-15 The aim of this monograph is to outline the physics of image formation electron specimen interactions and image interpretation in transmission electron microscopy Since the last edition transmission electron microscopy has undergone a rapid evolution The introduction of monochromators and proved energy filters has allowed electron energy loss spectra with an energy resolution down to about 0.1 eV to be obtained and aberration correctors are now available that push the point to point resolution limit down below 0.1 nm After the untimely death of Ludwig Reimer Dr Koelsch from Springer Verlag asked me if I would be willing to prepare a new edition of the book As it had served me as a reference for more than 20 years I agreed without hesitation Distinct from more specialized books on specific topics and from books intended for classroom teaching the Reimer book starts with the basic principles and gives a broad survey of the state of the art methods complemented by a list of references to allow the reader to find further details in the literature The main objective of this revised edition was therefore to include the new developments but leave the character of the book intact The presentation of the material follows the format of the previous edition as outlined in the preface to that volume which immediately follows A few derivations have been modified to correspond more closely to modern textbooks on quantum mechanics scattering theory or solid state physics

Advances in Imaging and Electron Physics, 1996-03-14 Advances in Imaging and Electron Physics is the merger of two long running serials Advances in Electronics and Electron Physics and Advances in Optical Electron Microscopy It 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

Advanced Transmission Electron Microscopy Jian Min Zuo, John C.H. Spence, 2016-10-26 This volume expands and updates the coverage in the authors popular 1992 book Electron Microdiffraction As the title implies the focus of the book has changed from electron microdiffraction and convergent beam electron diffraction to all forms of advanced transmission electron microscopy Special attention is given to electron diffraction and imaging including high resolution TEM and STEM imaging and the application of these methods to crystals their defects and nanostructures The authoritative text summarizes and develops most of the useful knowledge which has been gained over the years from the study of the multiple electron scattering problem the recent development of aberration correctors and their applications to materials structure characterization as well as the authors extensive teaching experience in these areas Advanced Transmission Electron Microscopy Imaging and Diffraction in Nanoscience is ideal for use as an advanced undergraduate or graduate level text in support of course materials in Materials Science Physics or Chemistry departments

Aberration-corrected Imaging In Transmission Electron Microscopy: An Introduction (2nd Edition) Rolf Erni, 2015-03-23 Aberration Corrected Imaging in Transmission Electron Microscopy provides an introduction

to aberration corrected atomic resolution electron microscopy imaging in materials and physical sciences It covers both the broad beam transmission mode TEM transmission electron microscopy and the scanning transmission mode STEM scanning transmission electron microscopy The book is structured in three parts The first part introduces the basics of conventional atomic resolution electron microscopy imaging in TEM and STEM modes This part also describes limits of conventional electron microscopes and possible artefacts which are caused by the intrinsic lens aberrations that are unavoidable in such instruments The second part introduces fundamental electron optical concepts and thus provides a brief introduction to electron optics Based on the first and second parts of the book the third part focuses on aberration correction it describes the various aberrations in electron microscopy and introduces the concepts of spherical aberration correctors and advanced aberration correctors including correctors for chromatic aberration This part also provides guidelines on how to optimize the imaging conditions for atomic resolution STEM and TEM imaging This second edition has been completely revised and updated in order to incorporate the very recent technological and scientific achievements that have been realized since the first edition appeared in 2010

Principles Of Electron Optics Applied Geometrical Optics Principles Of Electron Optics Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Principles Of Electron Optics Applied Geometrical Optics Principles Of Electron Optics**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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