

1. Record Nr.	UNINA9910144827603321
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Titolo	Theory and design of charged particle beams / / Martin Reiser ; with contributions by Patrick O'Shea, Santiago Bernal, and Rami Kishek
Pubbl/distr/stampa	Weinheim, [Germany] : , : Wiley-VCH Verlag GmbH & Co. KGaA, , 2008 ©2008
ISBN	1-282-37226-2 9786612372261 3-527-62204-7 3-527-62205-5
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (677 p.)
Collana	Wiley Series in Beam Physics and Accelerator Technology
Disciplina	539.7/3 539.73
Soggetti	Particle beams Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Theory and Design of Charged Particle Beams; Contents; Preface for 2(nd) Edition; Preface for 1(st) Edition; Acknowledgments for 2(nd) Edition; Acknowledgments for 1(st) Edition; 1 Introduction; 1.1 Exposition; 1.2 Historical Developments and Applications; 1.3 Sources of Charged Particles; References; 2 Review of Charged Particle Dynamics; 2.1 The Lorentz Force and the Equation of Motion; 2.2 The Energy Integral and Some General Formulas; 2.3 The Lagrangian and Hamiltonian Formalisms; 2.3.1 Hamilton's Principle and Lagrange's Equations 2.3.2 Generalized Potential and Lagrangian for Charged Particle Motion in an Electromagnetic Field2.3.3 Hamilton's Equations of Motion; 2.3.4 The Hamiltonian for Charged Particles and Some Conservation Theorems; 2.4 The Euler Trajectory Equations; 2.4.1 The Principle of Least Action and the Euler Equations; 2.4.2 Relativistic Euler Equations in Axially Symmetric Fields; 2.5 Analytic Examples of Charged Particle Motion; 2.5.1 Planar Diode without Space Charge; 2.5.2 Planar Diode with Space Charge (Child-Langmuir Law); 2.5.3 Charged Particle Motion

in a Uniform Magnetic Field

2.5.4 Charged Particle Motion in a Radial Electric Field 2.5.5 The Harmonic Oscillator; Reference; Problems; 3 Beam Optics and Focusing Systems without Space Charge; 3.1 Beam Emittance and Brightness; 3.2 Liouville's Theorem; 3.3 The Paraxial Ray Equation for Axially Symmetric Systems; 3.3.1 Series Representation of Axisymmetric Electric and Magnetic Fields; 3.3.2 Derivation of the Paraxial Ray Equation; 3.3.3 General Properties of the Solutions of the Paraxial Ray Equations; 3.4 Axially Symmetric Fields as Lenses; 3.4.1 General Parameters and Transfer Matrix of a Lens

3.8.1 Periodic Focusing with Thin Lenses 3.8.2 General Theory of Courant and Snyder; 3.8.3 The FODO Quadrupole Channel; 3.8.4 Sector-Focusing Cyclotrons; 3.8.5 Strong-Focusing Synchrotrons; 3.8.6 Resonances in Circular Accelerators; 3.9 Adiabatic Damping of the Betatron Oscillation Amplitudes; References; Problems; 4 Linear Beam Optics with Space Charge; 4.1 Theoretical Models of Beams with Space Charge; 4.2 Axisymmetric Beams in Drift Space; 4.2.1 Laminar Beam with Uniform Density Profile; 4.2.2 Beam Envelope with Self Fields and Finite Emittance

4.2.3 Limitations of the Uniform Beam Model and Limiting Currents

Sommario/riassunto

This indispensable work offers a broad synoptic description of beams, applicable to a wide range of other devices, such as low-energy focusing and transport systems and high-power microwave sources. The monograph develops the material from the basic principles in a systematic way and discusses the underlying physics and validity of theoretical relationships, design formulas and scaling laws. Assumptions and approximations are clearly indicated throughout. This new, revised and updated edition has 10% additional content, and features, among others, a new chapter on beam physics research from

2. Record Nr.

UNIORUON00265010

Titolo

Stato, democrazia e legittimità : Le transizioni politiche in Africa, America Latina, Balcani, Medio Oriente / a cura di Anna Maria Gentili, Mario Zamponi

Pubbl/distr/stampa

Roma, : Carocci, 2005

ISBN

88-430-3301-8

Descrizione fisica

239 p. ; 21 cm.

Soggetti

Politica comparata - Studi

Lingua di pubblicazione

Italiano

Formato

Materiale a stampa

Livello bibliografico

Monografia