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Nota di contenuto	An Introduction to the Physics of High Energy Accelerators; Contents; Series Preface; Preface; 1 Introduction; 1.1 Prerequisites; 1.2 Uses of Accelerators; 1.2.1 Luminosity of a High Energy Collider; 1.2.2 Synchrotron Radiation Sources; Problems; 2 Acceleration and Phase Stability; 2.1 Acceleration Methods; 2.1.1 DC Accelerators; 2.1.2 Time Varying Electromagnetic Fields; 2.1.3 Resonant Cavities; 2.1.4 Accelerating Structures; 2.2 Phase Stability; 2.2.1 Synchrotron Oscillations; 2.2.2 Adiabatic Damping and Longitudinal Emmittance; 2.2.3 Transition Crossing 2.3 The Need for Transverse FocusingProblems; 3 Transverse Linear Motion; 3.1 Stability of Transverse Oscillations; 3.1.1 Weak Focusing; 3.1.2 Strong Focusing; 3.1.3 Stability Criterion; 3.2 Equation of Motion; 3.2.1 Piecewise Method of Solution; 3.2.2 Closed Form Solution; 3.2.3 Courant-Snyder Parameters; 3.2.4 Emittance and Admittance; 3.2.5 Adiabatic Damping of Betatron Oscillations; 3.3 Momentum Dispersion; 3.3.1 Equation of Motion for an Off-Momentum Particle; 3.3.2 Solution of Equation of Motion; 3.4 Linear Deviations from the Ideal Lattice;

3.4.1 Steering Errors and Corrections

3.4.2 Focusing Errors and Corrections3.4.3 Chromaticity; Problems; 4 Resonances and Transverse Nonlinear Motion; 4.1 Transverse Resonances; 4.1.1 Floquet Transformation; 4.1.2 Multipole Expansion; 4.1.3 The Driven Oscillator and Rational Numbers; 4.2 A Third-Integer Resonance; 4.2.1 Equation of Motion; 4.2.2 Recognition of the Sextupole Resonance; 4.2.3 First Integral and the Separatrix; 4.2.4 Application to Resonant Extraction; 4.2.5 Comments on Correction Systems; 4.3 The Hamiltonian Formalism; 4.3.1 Review of Hamiltonian Dynamics; 4.3.2 The Hamiltonian for Small Transverse Oscillations 4.3.3 Transformations of the Hamiltonian4.3.4 The Third-Integer Resonance Revisited; Problems; 5 Transverse Coupled Motion; 5.1 Linear Coupling; 5.1.1 Coupled Harmonic Oscillators; 5.1.2 Perturbation Treatment of a Single Skew Quadrupole; 5.1.3 Matrix Treatment of a Single Skew Quadrupole; 5.1.4 Matrix Formalism of Linear Coupling; 5.2 Nonlinear Coupling; 5.2.1 Two-Degree-of-Freedom Sum Resonance Due to Distribution of Sextupoles; 5.2.2 Multipoles and Resonance Lines; Problems; 6 Intensity Dependent Effects; 6.1 Space Charge; 6.1.1 The Transverse Space Charge Force 6.1.2 Equation of Motion in the Presence of Space Charge6.1.3 Incoherent Tune Shift; 6.1.4 The Beam-Beam Tune Shift; 6.1.5 Image Charge and Image Current Effects; 6.2 The Negative Mass Instability; 6.2.1 The Longitudinal Space Charge Field; 6.2.2 Perturbation of the Line Density; 6.3 Wake Fields and Impedance; 6.3.1 Field of a Relativistic Charge in Vacuum; 6.3.2 Wake Field for a Resistive Wall; 6.3.3 Wake Functions; 6.3.4 Impedance; 6.4 Macroparticle Models of Coherent Instabilities; 6.4.1 Beam Breakup in Linacs; 6.4.2 The Strong Head-Tail Instability; 6.4.3 The Head-Tail Instability
6.5 Evolution of the Distribution Function

Sommario/riassunto

The first half deals with the motion of a single particle under the influence of electronic and magnetic fields. The basic language of linear and circular accelerators is developed. The principle of phase stability is introduced along with phase oscillations in linear accelerators and synchrotrons. Presents a treatment of betatron oscillations followed by an excursion into nonlinear dynamics and its application to accelerators. The second half discusses intensity dependent effects, particularly space charge and coherent instabilities. Includes tables of parameters for a selection of accelerato