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Nota di contenuto	Title Page; INDICE; Preface; Gruppo fotografico dei partecipanti al Corso; Physics of high-intensity laser-plasma interactions; Introduction; Field ionization; Plasma creation and characterization; Nonlinear laser propagation in underdense plasmas; Cold fluid equations; Electromagnetic waves; Electrostatic (Langmuir) waves; Dispersion properties; Relativistic self-focussing; Ponderomotive channel formation; Plasma wave propagation; Wakefield excitation; Electron acceleration; Laser interaction with solids; Collisional heating; Collisional absorption; Collisionless absorption Hot electron generation Ion acceleration; Numerical simulation of laser-plasma interactions; Hydrodynamics; Particle-in-cell codes; Tutorial on particle-in-cell simulation; The PIC code BOPS; Prerequisites; Installation; Running BOPS; Project I: Laser wakefield accelerator;

Project II: Ion acceleration-TNSA vs. RPA; Accelerator physics: Basic principles on beam focusing and transport; Introduction; Lamina and non-lamina beams; The emittance concept; The r.m.s envelope equation; External forces; Space charge forces; Correlated emittance oscillations

Matching conditions in a plasma acceleratorLasers for laser-plasma acceleration; Introduction; Ultrashort laser pulses; Defining an ultrashort laser pulse; Ultrashort-pulse generation; Mode-locking; Maximising the energy; Master Oscillator Power Amplifier; Amplification; Gain saturation; Gain narrowing; Beam quality; Chirped-pulse amplification; Contrast; Laser technologies; Glass laser systems; Titanium-sapphire systems; Diode-pumped systems; Optical parametric chirped-pulse amplification systems; Conclusions; Particle beam diagnostics and control; Introduction; Beam charge measurements

Intercepting measurementsNon-intercepting measurements; Beam position monitors; Broad-band BPM pickups; Resonant BPM pickups; Diagnostics for the transverse phase space; Beam matrix based schemes; Phase space mapping based schemes; Beam profile measurements; Diagnostics for the longitudinal phase space; Bunch length measurements; Energy spread; Beam energy; Beam synchronous timing; Laser plasma diagnostics; Introduction; Basic physical processes; CPA lasers in experiments; Laser-solid interaction; Role of ASE in the interaction with plastic foils; Experimental signatures of preplasma

Propagation in gases and optical probingPropagation of ultraintense laser pulses in gas-jets; Basic spectroscopy techniques; The single-photon detection technique; Energy-resolved imaging; Fast electron transport in multilayer targets; Directional bremsstrahlung; Ion acceleration to study target resistivity; Conclusions; Preliminary results of the self-injection test experiment (SITE) at FLAME; Introduction; FLAME laser system; FLAME target area and main diagnostic; SITE preliminary results; Conclusion; Development of a Multi-GeV spectrometer for laser-plasma experiments at FLAME
Introduction

Sommario/riassunto

Impressive progress has been made in the field of laser-plasma acceleration in the last decade, with outstanding achievements from both experimental and theoretical viewpoints. Closely exploiting the development of ultra-intense, ultrashort pulse lasers, laser-plasma acceleration has developed rapidly, achieving accelerating gradients of the order of tens of GeV/m, and making the prospect of miniature accelerators a more realistic possibility. This book presents the lectures delivered at the Enrico Fermi International School of Physics and summer school: "Laser-Plasma Acceleration" , held in Varenna, Italy, in June 2011. The school provided an opportunity for young scientists to experience the best from the worlds of laser-plasma and accelerator physics, with intensive training and hands-on opportunities related to key aspects of laser-plasma acceleration. Subjects covered include: the secrets of lasers; the power of numerical simulations; beam dynamics; and the elusive world of laboratory plasmas. The objective of the school was to establish a common knowledge base for the future laser-plasma accelerator community. These published proceedings aim to provide a wider community with a reference covering a wide range of topics, knowledge of which will be necessary to future research on laser-plasma acceleration. The book also provides references to selected existing literature for further reading.
