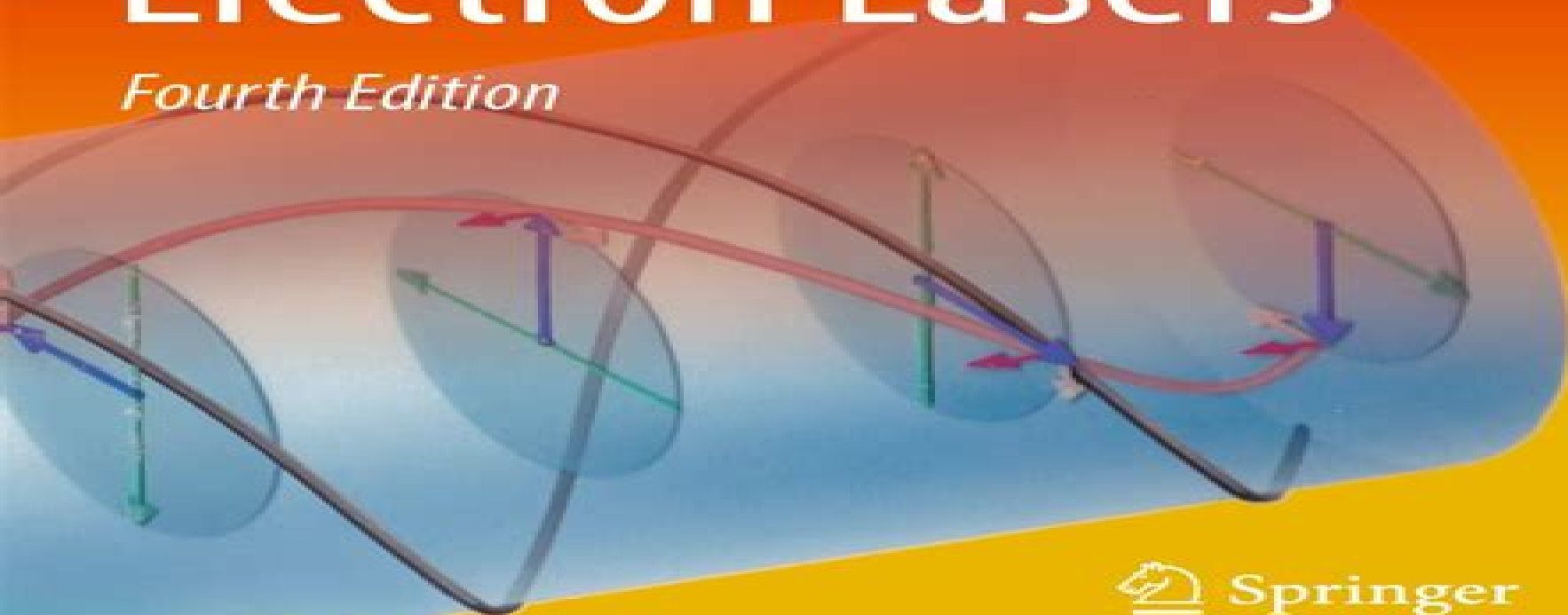


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Principles of Free Electron Lasers

Fourth Edition



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**Peter Schmöser, Martin Dohlus, Jörg
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Principles of Free-electron Lasers H.P. Freund, T.M. Antonsen, 1996-08-31 This book is the definitive tutorial text and reference work on free electron lasers Since the publication of the first edition in 1992 there has been a significant increase both in the number of free electron lasers in use worldwide and in the understanding of the various regimes for these devices In order to maintain the position of this book as the most comprehensive and thorough reference and tutorial in the field the authors have completely updated the book In addition to updates and corrections to chapters in the first edition new chapters have been added

Principles of Free Electron Lasers Trudy Bellinger, 2015-02-06 This book elucidates the principles of free electron lasers with the help of valuable information It talks about the basics and patterns of different free electron laser systems ranging from infrared to XUV wavelength regimes Besides discussing and comparing with traditional lasers matters like near field and cavity electrodynamics compact and table top arrangements and strong radiation induced exotic states of matter have also been assessed The management and evaluation of such instruments and radiation safety problems have also been described This book presents a set of research results on these sources of radiation relating to primary principles applications and some recent captivating ideas of current interest

Ultraviolet and Soft X-Ray Free-Electron Lasers Peter Schmüser, Martin Dohlus, Jörg Rossbach, 2009-08-29 The high scientific interest in coherent X ray light sources has stimulated world wide efforts in developing X ray lasers In this book a particularly promising approach is described the free electron laser FEL which is pursued worldwide and holds the promise to deliver ultra bright X ray pulses of femtosecond duration Other types of X ray lasers are not discussed nor do we try a comparison of the relative virtues and drawbacks of different concepts The book has an introductory character and is written in the style of a university textbook for the many newcomers to the field of free electron lasers graduate students as well as

accelerator physicists engineers and technicians it is not intended to be a scientific monograph for the experts in the field Building on lectures by one of us J R at the CERN Accelerator School and motivated by the positive response to a series of seminars on FEL theory for pedestrians given by P S within the framework of the Academic Training Program at DESY we have aimed at presenting the theory of the low gain and the high gain FEL in a clear and concise mathematical language Particular emphasis is put on explaining and justifying the assumptions and approximations that are needed to obtain the differential equations describing the FEL dynamics Although we have tried our best to be simple the mathematical derivations are certainly not always as simple as one would like them to be However we are not aware of any easier approach to the FEL theory Some of the more involved calculations are put into the appendices

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Synchrotron Radiation and Free-Electron Lasers Kwang-Je Kim, Zhirong Huang, Ryan Lindberg, 2017-03-23 Preliminary concepts Synchrotron radiation Basic FEL physics 1D FEL analysis 3D FEL analysis Harmonic generation in high gain FELs FEL oscillators and coherent hard X rays Practical considerations and experimental results for high gain FELs

Free Electron Lasers Sandor Varro, 2012-03-14 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

Free Electron Lasers S. Martellucci, A.N. Chester, 2013-03-09 The volume contains the proceedings of the 7th Course on Physics and Technology of Free Electron Lasers of the International School of Quantum Electronics which was held in Erice Italy from 17 to 29 August 1980 under the auspices of the Ettore Majorana Centre for Scientific Culture The level of this Course was much closer to a workshop than to a school and Advances in Free Electron Lasers might have been an appropriate title Many of the world's leading scientists in the field among them the inventor of FEL J M J Madey were brought together to review the accomplishments of FEL experiments as well various trends in FEL theory In editing this material we did not modify the original manuscripts except to assist in uniformity of style The papers are presented without reference to the chronology of the Course but in the following topical arrangement A Fundamentals of free electron lasers a group of tutorial papers B Free electron lasers operating in the Compton regime where theories and experiments of FELs based on Compton scattering are reviewed C Free electron lasers operating in the Raman regime a discussion of FELs based on Raman scattering D Optical klystrons where the possibility of this class of FEL is discussed from a theoretical viewpoint E

Free-Electron Lasers in the Ultraviolet and X-Ray Regime Peter Schmüser, Martin Dohlus, Jörg Rossbach, Christopher Behrens, 2014-02-19 The main goal of the book is to provide a systematic and didactic approach to the physics and technology of free electron lasers Numerous figures are used for illustrating the underlying ideas and concepts and links to other fields of physics are provided After an introduction to undulator radiation and the low gain FEL the one dimensional theory of the high gain FEL is developed in a systematic way Particular emphasis is put on explaining and justifying the various assumptions and approximations that are needed to obtain the differential and integral equations governing the FEL dynamics Analytical and numerical solutions are presented and important FEL parameters are defined such as gain length FEL bandwidth and saturation power One of the most important features of a high gain FEL the formation of microbunches is studied at length The increase of gain length due to beam energy spread space charge forces and three dimensional effects such as betatron oscillations and optical diffraction is analyzed The mechanism of Self Amplified Spontaneous Emission is described theoretically and illustrated with numerous experimental results Various methods of FEL seeding by coherent external radiation are introduced together with experimental results The world's first soft X ray FEL the user facility FLASH at DESY is described in some detail to give an impression of the complexity of such an accelerator based light source The last chapter is devoted to the new hard X ray FELs which generate extremely intense radiation in the Angstrom regime The appendices contain supplementary material and more involved calculations

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