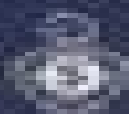


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Ortwin Hess

Spatio-Temporal Dynamics and Quantum Fluctuations in Semiconductor Lasers

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Spatiotemporal Dynamics And Quantum Fluctuations In Semiconductor Lasers

AN Whitehead



Spatiotemporal Dynamics And Quantum Fluctuations In Semiconductor Lasers:

Spatio-Temporal Dynamics and Quantum Fluctuations in Semiconductor Lasers Edeltraud Gehrig, Ortwin Hess, 2003-09-22 Presents fundamental theories and simulations of the spatio temporal dynamics and quantum fluctuations in semiconductor lasers The dynamic interplay of light and matter is theoretically described by taking into account microscopic carrier dynamics spatially dependent light field propagation and the influence of spontaneous emission and noise

Semiconductor Lasers Junji Ohtsubo, 2017-05-03 This book describes the fascinating recent advances made concerning the chaos stability and instability of semiconductor lasers and discusses their applications and future prospects in detail It emphasizes the dynamics in semiconductor lasers by optical and electronic feedback optical injection and injection current modulation Applications of semiconductor laser chaos control and noise and semiconductor lasers are also demonstrated Semiconductor lasers with new structures such as vertical cavity surface emitting lasers and broad area semiconductor lasers are intriguing and promising devices Current topics include fast physical number generation using chaotic semiconductor lasers for secure communication development of chaos quantum dot semiconductor lasers and quantum cascade semiconductor lasers and vertical cavity surface emitting lasers This fourth edition has been significantly expanded to reflect the latest developments The fundamental theory of laser chaos and the chaotic dynamics in semiconductor lasers are discussed but also for example the method of self mixing interferometry in quantum cascade lasers which is indispensable in practical applications Further this edition covers chaos synchronization between two lasers and the application to secure optical communications Another new topic is the consistency and synchronization property of many coupled semiconductor lasers in connection with the analogy of the dynamics between synaptic neurons and chaotic semiconductor lasers which are compatible nonlinear dynamic elements In particular zero lag synchronization between distant neurons plays a crucial role for information processing in the brain Lastly the book presents an application of the consistency and synchronization property in chaotic semiconductor lasers namely a type of neuro inspired information processing referred to as reservoir computing

Semiconductor Lasers and Laser Dynamics, 2004 Nonlinear Spatio-Temporal Dynamics and Chaos in Semiconductors Eckehard Schöll, 2001-02-22 This book brings together concepts from semiconductor physics nonlinear dynamics and chaos to examine semiconductor transport phenomena

Spatio-Temporal Modeling and Device Optimization of Passively Mode-Locked Semiconductor Lasers Stefan Meinecke, 2022-03-26 This thesis investigates passively mode locked semiconductor lasers by numerical methods The understanding and optimization of such devices is crucial to the advancement of technologies such as optical data communication and dual comb spectroscopy The focus of the thesis is therefore on the development of efficient numerical models which are able both to perform larger parameter studies and to provide quantitative predictions Along with that visualization and evaluation techniques for the rich spatio temporal laser dynamics are developed these facilitate the physical

interpretation of the observed features The investigations in this thesis revolve around two specific semiconductor devices namely a monolithically integrated three section tapered quantum dot laser and a V shaped external cavity laser In both cases the simulations closely tie in with experimental results which have been obtained in collaboration with the TU Darmstadt and the ETH Zurich Based on the successful numerical reproduction of the experimental findings the emission dynamics of both lasers can be understood in terms of the cavity geometry and the active medium dynamics The latter in particular highlights the value of the developed simulation tools since the fast charge carrier dynamics are generally not experimentally accessible during mode locking operation Lastly the numerical models are used to perform laser design explorations and thus to derive recommendations for further optimizations

Control of Complex Nonlinear Systems with Delay Philipp Hövel, 2010-09-27 This research addresses delay effects in nonlinear systems which are ubiquitous in various fields of physics chemistry biology engineering and even in social and economic systems They may arise as a result of processing times or due to the finite propagation speed of information between the constituents of a complex system Time delay has two complementary counterintuitive and almost contradictory facets On the one hand delay is able to induce instabilities bifurcations of periodic and more complicated orbits multi stability and chaotic motion On the other hand it can suppress instabilities stabilize unstable stationary or periodic states and may control complex chaotic dynamics This thesis deals with both aspects and presents novel fundamental results on the controllability of nonlinear dynamics by time delayed feedback as well as applications to lasers hybrid mechanical systems and coupled neural systems

Chemical Abstracts, 2002

Nonlinear Optical Cavity Dynamics Philippe Grelu, 2015-12-23 By recirculating light in a nonlinear propagation medium the nonlinear optical cavity allows for countless options of light transformation and manipulation In passive media optical bistability and frequency conversion are central figures In active media laser light can be generated with versatile underlying dynamics Emphasizing on ultrafast dynamics the vital arena for the information technology the soliton is a common conceptual keyword thriving into its modern developments with the closely related denominations of dissipative solitons and cavity solitons Recent technological breakthroughs in optical cavities from micro resonators to ultra long fiber cavities have entitled the exploration of nonlinear optical dynamics over unprecedented spatial and temporal orders of magnitude By gathering key contributions by renowned experts this book aims at bridging the gap between recent research topics with a view to foster cross fertilization between research areas and stimulating creative optical engineering design

European Quantum Electronics Conference, 2005 *Laser Physics*, 1996

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