



Theory of Semiconductor Quantum Devices: Microscopic Modeling and Simulation Strategies (NanoScience and Technology)

By Fausto Rossi

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Primary goal of this book is to provide a cohesive description of the vast field of semiconductor quantum devices, with special emphasis on basic quantum-mechanical phenomena governing the electro-optical response of new-generation nanomaterials. The book will cover within a common language different types of optoelectronic nanodevices, including quantum-cascade laser sources and detectors, few-electron/exciton quantum devices, and semiconductor-based quantum logic gates. The distinguishing feature of the present volume is a unified microscopic treatment of quantum-transport and coherent-optics phenomena on ultrasmall space- and time-scales, as well as of their semiclassical counterparts.

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Review

From the reviews:

“This book is the result of 20 years of research activities on fundamental issues related to quantum transport as well as coherent optical phenomena in semiconductor bulk and nanostructures. It covers different types of optoelectronic nanodevices, including quantum cascade laser sources and detectors, electron/exciton quantum devices and semiconductor based quantum logic gates. It is well organized and includes references and an index. ... suitable for graduate students as well as researchers.” (Lisa Tongning Li, Optics & Photonics News, July, 2011)

From the Back Cover

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About the Author

Fausto Rossi was born in Carpi (Italy) on 12/05/1962. Education: Laurea in Physics in 1988 at the University of Modena (110/110 cum Laude) and Ph.D. in Physics at the University of Parma in 1993. Present appointment: Full Professor of Matter Physics at the Polytechnic University of Torino.

Prof. Rossi has published more than 200 research articles on international journals and books; he has been an invited lecturer at over 80 international conferences, workshops and schools.

He has served as member of the Editorial Board of the Institute of Physics (IOP) and he is currently member of the International Semiconductor Commission (C8) of the International Union of Pure and Applied Physics (IUPAP).

His research activity includes: Theoretical investigation of ultrafast processes in bulk and low-dimensional semiconductors. Analysis of quantum-transport phenomena in the high-field regime. Study of the linear and non-linear optical response of quantum-wires and dots in the presence of Coulomb-correlation effects. Analysis of few-electron phenomena in artificial macroatoms. Microscopic modelling of state-of-the-art optoelectronic quantum devices, like quantum-cascade lasers. Implementation of quantum information processing with semiconductor nanostructures. Broad experience in the formal theory of stochastic simulations.

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