

Curriculum Vitae Prof. Fausto Rossi

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:

Professor of Condensed Matter Physics and Head of the NTL Lab at the Physics Department of Politecnico di Torino.

Member of the Editorial Board of the Institute of Physics (IOP).

Member of the Semiconductor Commission (C8) of the International Union of Pure and Applied Physics (IUPAP).

Prof. Rossi has published more than 200 research articles on international journals and books; he has been an invited lecturer at over 50 international conferences, workshops and schools.

Previous appointments:

1/11/1992 - 31/01/1993: Visiting Researcher at the Max-Planck Arbeitsgruppe Halbleiterteorie of Berlin within a project entitled 'Quantum kinetics and memory effects in semiconductors' coordinated by Roland Zimmermann.

1/2/1993 - 31/1/1996: Lecturer and Visiting Researcher at the Fachbereich Physik und Zentrum für Materialwissenschaften of the Philipps-Universität Marburg (Germany) with a project entitled 'Monte Carlo simulation of coherent and incoherent phenomena in photoexcited semiconductors' within the Human Capital and Mobility (HCM) research programme of the European Commission.

1/2/1996 - 31/10/1998: Post-Doctoral Researcher at the Physics Department of the University of Modena on 'Optical properties of low-dimensional semiconductor nanostructures' within the division "Semiconduttori ed Isolanti" of the INFM.

Research Activities:

- 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 modeling 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.

More specifically, Fausto Rossi has extremely broad experience in the theoretical modeling of many-body processes in semiconductors as well as in the formal theory and

mathematical foundation of quantum information/computation. Within semiconductor physics and technology, he has a long tradition in the theory and simulation of nonequilibrium phenomena both in bulk and in nanostructured materials/devices, e.g., semiconductor superlattices, quantum wells, wires and dots. In particular, he has wide-ranging experience in the theoretical modeling of ultrafast coherent quantum phenomena in semiconductors [F. Rossi and T. Kuhn, *Rev. Mod. Phys.* 74 (2002)].

Together with Tilmann Kuhn (Uni-Muenster) in 1992 he proposed the first Monte Carlo method for the microscopic simulation of ultrafast coherent phenomena in photoexcited semiconductors [T. Kuhn and F. Rossi, *Phys. Rev. Lett.* 69, 977 (1992)]. The method has proved to be quite successful in understanding the fundamental physical processes which govern the ultrafast optical response of semiconductor bulk and nanostructures; Indeed, together with Thomas Elsaesser and co-workers (TU-Berlin) he has been able to explain a number of state-of-the-art coherent optical experiments [see, e.g., A. Leitenstorfer et al., *Phys. Rev. Lett.* 73, 1687 (1994)].

In collaboration with Roberto Cingolani (NNL, Lecce) and Guido Goldoni (Uni-Modena) he has extensively worked on the optical properties of low-dimensional structures (mainly quantum wires and dots), with particular attention to Coulomb-correlation effects [F. Rossi and E. Molinari, *Phys. Rev. Lett.* 76, 3642 (1996)]. In collaboration with Paolo Lugli and co-workers (Uni-Roma II) he has studied quantum-transport phenomena in mesoscopic systems, with particular attention to energy-relaxation and dephasing processes in quantum open systems [F. Rossi et al., *Phys. Rev. Lett.* 80, 3348 (1998)].

More recently, in collaboration with Fabio Beltram and co-workers (NEST, Pisa) he has been working on the design and simulation of semiconductor-based quantum-cascade lasers [R.C. Iotti and F. Rossi, *Phys. Rev. Lett.* 87, 146603 (2001)], both in the mid- and in the far infrared spectral region. This activity has led to the design and fabrication of the first Terahertz laser [R. Koehler et al., *Nature* 417, 156 (2002)]. Concerning quantum information processing, together with Paolo Zanardi and co-workers (ISI, Torino) Fausto Rossi has been working on potential solid-state implementation schemes. In particular, he has studied noiseless-encoding strategies in semiconductor quantum-dot arrays [P. Zanardi and F. Rossi, *Phys. Rev. Lett.* 81, 4752 (1998)] and, more recently, he has proposed the first all-optical quantum computer based on semiconductor macroatoms/molecules [E. Biolatti et al., *Phys. Rev. Lett.* 85, 5647 (2000)].

Editorial Activities:

Since 1993 scientific reviewer for the American Institute of Physics (AIP) and for the European Physical Society (EPS).

Since 1995 scientific consultant for the American Research Office (ARO) and for the Office of Naval Research (ONR).

Since 1998 member of the Editorial Board of the journal *Semiconductor Science and Technology*, published by the Institute of Physics (IOP).

Since 2000 scientific consultant for the European Science Foundation (ESF).

Since 2001 scientific consultant for the Agenzia Spaziale Italiana (ASI).

Management Activities:

-Member of the Program Committee of the '6th International Workshop on Nonlinear Optics and Kinetics in Semiconductors (NOEKS-6)', Marburg, Germany.

-Member of the Program committee of the '12th International Conference on Nonequilibrium Carrier Dynamics in Semiconductors (HCIS-12)', Sante Fe, New Mexico, USA.

-Member of the Program committee of the '9th International Workshop on Computational Electronics (IWCE-9)', Roma, Italy.

- Chairman of the Program committee of the '13th International Conference on Nonequilibrium Carrier Dynamics in Semiconductors (HCIS-13)', Modena, Italy.
- Member of the Program Committee of the '8th International Workshop on Nonlinear Optics and Kinetics in Semiconductors (NOEKS-8)', Muenster, Germany.

National and international project coordination:

- National coordinator of the PRIN Project 2009 'A controlled nanofabrication strategy for the optical manipulation of few-electron states in quantum dot based photonic devices' cofinanced by the Italian Ministry of Education and Research (MIUR).
- National coordinator of the PRIN Project 2006 'Few-electron phenomena in semiconductor-quantum-dot devices' cofinanced by the Italian Ministry of Education and Research (MIUR).
- Coordinator of the two-year project 'Novel approaches to the study of transport in nanometer-scale semiconductor devices' financed by the US Office of Naval Research (ONR).
- Coordinator of the advanced project 'Simulation of Quantum Optoelectronic Devices - SQuOD' financed by the Sezione Semiconduttori ed Isolanti of INFM.
- Coordinator of the three-year european project 'Semiconductor-based implementation of Quantum-Information processing Devices - SQID' financed by the European Commission within the Future and Emerging Technologies (FET) programme of the 5th Framework Programme.

Books and most significant review articles:

- F. Rossi, 'Theory of Semiconductor quantum devices' (Springer, Berlin, 2011).
- Semiconductor Macroatoms: Basic Physics and Quantum-Device Applications, Edited by Fausto Rossi (Imperial College Press, London, 2005).
- F. Rossi, 'The excitonic quantum computer', IEEE Transactions on Nanotechnology 3, 165 (2004).
- F. Rossi and T. Kuhn, 'Theory of ultrafast phenomena in photoexcited semiconductors', Rev. Mod. Phys. 74, 895 (2002).
- F. Rossi, 'Coherent phenomena in semiconductors', Semicond. Sci. Technol. 13, 147 (1998).