

PhD in Electrical, Electronics and Communications Engineering

Research Title: Multiscale & multiphysics modeling of optoelectronic devices

Funded by	Dipartimento di Elettronica e Telecomunicazioni (DET) Proff. M. Goano, F. Bertazzi, G. Ghione
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Contact	http://www.det.polito.it/research/research_areas/electronics/rf_microwave_and_computational_electronics
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Context of the research activity	The operation of all semiconductor optoelectronic devices (such as light-emitting diodes, lasers, photodetectors and optical modulators) results from the interaction of carrier transport (modeled either in a semiclassical framework or with a full quantum approach) and optical phenomena (described by electromagnetic field theory). For such reason, optoelectronic computer-aided design cannot neglect either aspect, and requires the development of self-consistent multiphysics simulators.
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Objectives	The first goal of the project is to introduce the candidate to the research activity currently devoted to the development of a comprehensive numerical simulator for semiconductor optoelectronic devices within the Microwaves and Optoelectronics Group of the Department of Electronics and Telecommunications. This activity is backed by cooperations with both theoretical/modeling groups contributing to the code development (e.g., the Computational Electronics group led by Prof. Enrico Bellotti at Boston University, U.S.A, and the Applied Electromagnetics group at CNR-IEIT, Italy),
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	to experimental groups providing essential validation (Università di Padova, Chalmers University of Technology) and with industrial companies (Cisco Photonics, AIM Infrarot Module, Huawei, etc.) The PhD student will be involved both in design activities with external partners and in the validation/development of the simulator.
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Skills and competences for the development of the activity	Basic knowledge of semiconductor physics, applied electromagnetics, and operating principles of electronic/optoelectronic devices. Coding skills in a Matlab-like environment and/or in a programming language suitable for numerical analysis (Fortran, C/C++, Python...)
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