



## Hybrid III-V semiconductors/SOI Nanolasers

A Scholarship for a Ph.D is available at the “Laboratoire de Photonique et de Nanostructures” (LPN) and STMicroelectronics to investigate hybrid III-V semiconductor/Silicon nanolasers. The goal of the PhD is to produce optical devices exhibiting ultimate performance in terms of footprint, energy consumption and operating speed by exploiting the concepts of nanophotonics and especially photonic crystals. Photonic crystals, with their lattice dimensions of the order of the light wavelength, enable the opening of wide photonic band gaps giving a handle on light propagation. This is particularly interesting for forming ultra-high Q cavities which allow to obtain important light-matter interaction and, thereby, low threshold laser emission.

During this PhD, the selected candidate will first carry out the numerical studies necessary to the understanding of the light propagation in the micro-nanostructures of interest and to the design of nanolasers optically and electrically pumped. Then, the attention will be focused to the technological realisation of the structures and their experimental characterisation.

LPN, situated not far from Paris, is involved in four main research areas which are deeply interdependent: optics, nanostructures, materials and devices. This institute has a 1000m<sup>2</sup> clean-room supported by the French basic research technology network. The clean-room is mainly dedicated to the fabrication and characterisation of the III-V semiconductor micro/nano-structures. The available technological competences range from epitaxial to material patterning using high resolution electron beam lithography and different techniques of plasma etching. The Photonic Crystal and Hetero-Integration team involved in this project has an international reputation for its outstanding results in the domain of nonlinear optics, III-V semiconductors and 1D and 2D Photonic Crystals.

Funded in 1987, STMicroelectronics is the European leader in providing semiconductor solutions with more than 51 000 collaborators located in 36 countries. The components fabricated at ST are at the heart of all the electronic systems for telecom, computers, automobile, smart cards...

References of two papers are given below to give an idea of the work done recently:

T. Karle et al, “Heterogeneous integration and precise alignment of InP-based photonic crystal lasers to complementary metal-oxide semiconductor fabricated silicon-on-insulator wire waveguides,” J. Appl. Phys. 107, 063103 (2010).

Y. Halioua et al, “Hybrid III-V semiconductor/silicon nanolaser”, Opt. Express 19, 9221-31 (2011).

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