University of Pavia

Physics Department "A. Volta"

Photonics and Nanostructures Group

http://fisicavolta.unipv.it/Nanophotonics

Postdoctoral position in Silicon photonics

Within FP7 EraNet project LECSIN

http://fisicavolta.unipv.it/Nanophotonics/Projects/lecsin

Subject: **Control of spontaneous emission in crystalline silicon photonic nanostructures**

One of the bottlenecks for the widespread application of Silicon Photonics, and for the merging of electronic and optical functions on the same chip, is the lack of efficient light sources in Silicon. By doping silicon with erbium ions, it is possible to obtain a radiative transition in the *4f* shell of the rare earth at ~1.54 μm. This system is very promising for obtaining controlled (and, possibly, electrically driven) light emission at telecom wavelengths. Recently, silicon-based photonic nanostructures, in particular photonic crystals and nanocavities, attracted great attention due to the possibility of strongly enhance radiation-matter interaction at a nanometer scale. During this post-doctoral research stay, the candidate will study the control of radiative emission of Erbium ions in photonic crystal nanostructures made of crystalline Silicon, with the goal of achieving strong Purcell effect and efficient light emission at ~1.54 μm.

Starting from the experience acquired by the Group in the study of the optical properties of photonic crystals and nanostructures, the applicant will participate to optical experiments on photonic crystal waveguides and nanocavities containing active Erbium ions. Resonant light scattering will be used to measure the high-Q cavity modes and their interaction with Er^{3+} ions. To tailor the radiative dynamics and to enhance optical gain, the cavity modes will be tuned to resonance with the narrow emission lines of Er^{3+}. Low-temperature micro-photoluminescence, end-fire waveguide transmission and pump-probe experiments will probe the radiative emission of Er^{3+}, to achieve strong Purcell effect and eventually lasing. Quantum electrodynamical effects related to strong interaction of Er3+ ions and high-Q cavity modes, such as supperradiance and other collective effects, will be also explored.

Since the proposed work is mainly experimental, the candidate should preferably have a good experience in optical spectroscopy and nanophotonics.

Deadline for applications: 23 april 2010
Duration: 2 Years
Starting date: May 2010 or to be agreed
Starting Salary: Euro 18,000/year
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