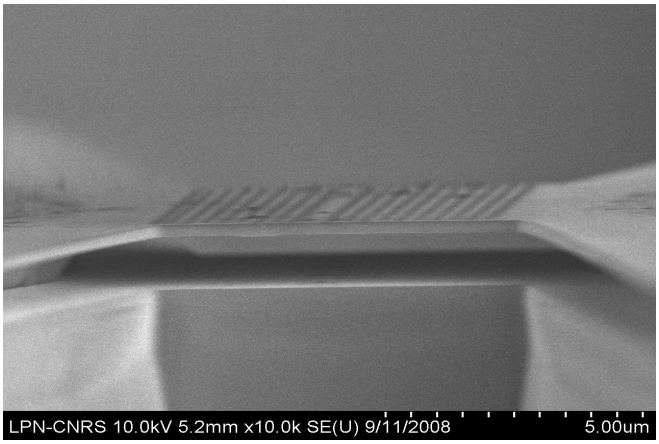
Laboratoire
de Photonique
et de Nanostructures

PhD topics on optomechanics

Optomechanics deals with the interaction of light with a mechanical oscillator. It utilizes the coupling between light and the geometry of a mechanical oscillator (for example through radiation pressure) to read or tailor the mechanical motion of the oscillator. Optomechanical coupling can be enhanced by use of an optical cavity that confines the electromagnetic field and thus increases the optical power seen by the mechanical oscillator. This coupling is also stronger at the nano-scale because of the very small mass of nano-mechanical oscillators.



Optomechanical coupling is expected to enable novel applications in the fields of metrology, sensing, actuation, classical or quantum information.... A first objective of the project is to develop **novel compact optomechanical nano-resonators, based on photonic crystals slab resonators**. Such platforms have already been studied for more than one decade and have been widely employed in nanophotonics or in solid state quantum optics, due to the tight optical confinement they provide. It has been realized only very recently that such suspended structures also sustain mechanical excitations interacting strongly to the optical degrees of freedom via optical forces: Photonic crystal slab resonators sustain mechanical excitations and in particular localized high-frequency vibrations (up to 1 GHz) that are strongly coupled to photons. A second objective is to demonstrate the feasibility of classical applications of the coupling of light to localized mechanical vibrations, in particular **microwave oscillators**. The issue of the oscillator's stability and synchronization will be investigated; different synchronization schemes will be pursued, such as self-synchronization in the non-linear regime or in arrays of coupled oscillators.

This PhD-topic is carried out in the context of the **EU-funded Marie Curie training network cQOM** (“Cavity Quantum Optomechanics”). It will involve nanofabrication in the laboratory's clean rooms as well as experimental work. Workshops and exchanges with the most prestigious groups working in the domain of cavity optomechanics in Europe are planned.

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