Open post-doctoral position

Topics	**Nano-optomechanics for time-frequency metrology and microwave photonics** Towards an optomechanically-driven microwave oscillator
Place	**Laboratoire de Photonique et de Nanostructures** Route de Nozay - 91460 Marcoussis
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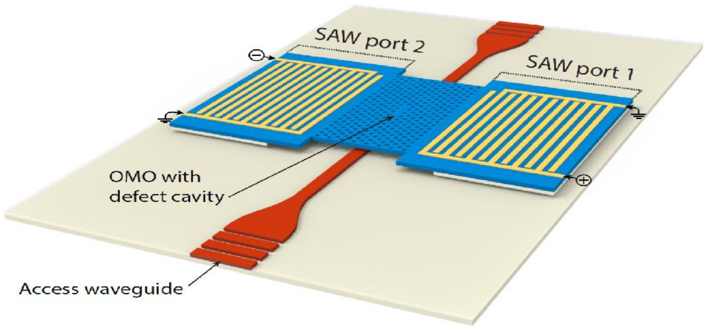
Webpage	http://www.lpn.cnrs.fr/fr/NanoPhotonIQ/Optomeca.php
Funding	**Labex Nanosaclay (http://nanosaclay.fr/)** CONDOR project
Date of proposal	January 2016
Possible starting date	October 2016
Applicant profile	Experience in advanced optical experiments

Recent advances in nanophotonics have enabled co-design of mechanical and optical resonances in the same device, opening the way to optomechanics experiments at nanoscale. A notable contribution that has come out of this area, is the manifestation of parametric instability, resulting in mechanical amplification and thereby oscillation of the mechanical mode driven purely optically. This ability to achieve self-sustained oscillation with no need for feedback electronics makes optomechanical oscillators compelling for on-chip applications such as microwave clocks, in which directed light energy from a laser is available to fuel the oscillation.

In this project, the photonic clock architecture will rely on **an integrated high-quality optomechanical nanoresonator, in order to achieve very stable oscillation in the GHz range**, where the lack of good quality and miniaturized sources is a severe issue. Thanks to the strong reduction of the oscillator dimensions down to nanoscale, the resonator will sustain mechanical modes strongly coupled to light up to 3-5 GHz, directly at the operating frequency of interest for optoelectronic microwave oscillators and metrology applications. One main issue is the stability of the oscillator's output, as gauged over short time spans by its phase noise. Stabilization will be achieved by implementing on-chip optoelectronic loops, exploiting either an optical or acoustic control of mechanical motion along different schemes including locking on a reference frequency or self-injection locking.

This project will be carried out in strong collaboration with Thales-RT for the specifications of the devices and their phase noise measurements .



Schematics of the fully-integrated optomechanical platform integrating the photonic crystal optomechanical oscillator - OMO - (in blue - allowing for an optical control of mechanical motion), an integrated optical waveguide below the resonator (in red) and surface acoustic wave transducers on top (in yellow - allowing for an acoustical control of mechanical motion).

References :

- V. Tsvirkun *et al*, Scientific Reports 5, 16526 (2015)
- K. Makles *et al*, Opt. Lett. 40, 174 (2015)
- E. Gavartin *et al*, Phys. Rev. Lett. 106, 203902 (2011)