Open position for Post-doc

Nano-optomechanics for time-frequency metrology and microwave photonics: Towards an optomechanically-driven microwave oscillator

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 [1]. 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 resonator (OMR, see Fig. 1), namely a photonic crystal defect cavity, 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.

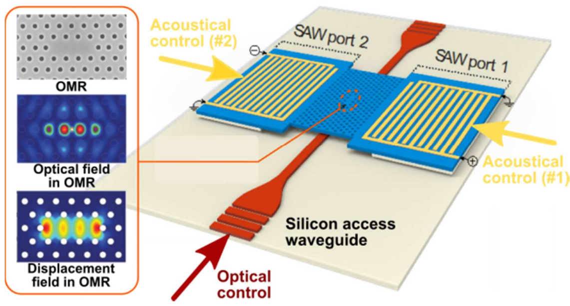

Fig. 1: Sketch of the targeted device with the OMR and the optical and displacement field located in the core of the defect photonic crystal. The OMR could be probed and control by optical means (silicon access waveguide) or acoustically (surface acoustic wave transducers)

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 (silicon access waveguide) or acoustic (surface acoustic wave transducers) control of mechanical motion along different schemes including locking on a reference frequency or self-injection locking (See Fig. 1). This project will be carried out in strong collaboration with Thales-RT for the specifications of the devices and their phase noise measurements.

The post-doc will be involved from the fabrication of the device to the investigation of optomechanical effects for metrology, in particular assessing their potential for implementing ultra-stable compact microwave clocks for time-frequency metrology.

[1] Gavartin et al, Phys. Rev. Lett. **106**, 203902 (2011)

Please send the following application documents to: Rémy BRAIVE
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- Cover letter expressing your motivation in the position
- CV