

## Internship proposal

**topic n°? : « Wireless Remote control of a quantum state optical device »**

**Team (s): CMA**

**Keywords:** Optics, Quantic

**Supervisor (s):** F. Ferrero, L. Labonte

**Training place:** LEAT & INFINI Laboratory

### **Summary of the research proposal:**

The internship will take place in the frame of OPENING project (**On-chiP wirelEss quantum state eNginerING**).

Quantum information science has established a new benchmark in metrology and processing of information, thanks to protocols allowing augmented security in data exchange and increased processing capabilities. In this context, integrated quantum photonics has shown high potential for experimental demonstrations [Politi08, Tanzilli12]. The OPENING project aims at developing an innovative wireless photonic integrated circuits (PICs) on a hybrid platform for manipulation of advanced quantum states. The hybrid silicon (Si) platform is maturing fast as increasingly complex circuits are reported with tens of integrated components on a single chip.

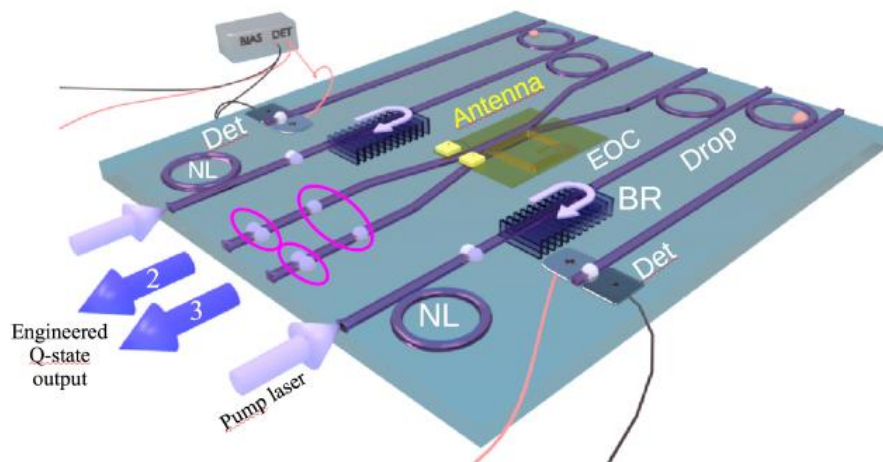
This platform is well-positioned and holds great potential to address future needs for mediumscale PICs. OPENING therefore aims at exploiting this potential for the development of advanced and scalable wireless photonics circuits, thanks to silicon inherent properties. The objective is two-fold here: we propose to demonstrate for the first time a chip designed for the generation of heralded engineered entanglement but the real asset for the project lies in the wireless control of the chip. The CMOS compatible key advantage hasn't been exploited yet in this field and we propose to merge the contribution of three institutes (Inria, INΦNI and LEAT) for enabling wireless controlled of quantum chip, gathering quantum light sources and single photon manipulation stages. It should certainly lead to beyond state-of-the-art progress in quantum devices and novel prospects in quantum optics.

### **Internship Objective: Driving the optical device by a wireless connection**

Integration of a wireless connectivity constitutes the cornerstone of the OPENING project will require an important collaboration from the 3 partners.

The internship will have to define the optimal frequency and circuit to remotely activate the optical device. Considering the design of the chip, at tradeoff will be found between the size and communication distance.

Several solutions based on rectifier and antenna will be investigated.



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