Open PhD position 2020-2023
Optics and Photonics

Integrated superconducting single photon detectors on silicon for quantum information technology

In the framework of the development of an integrated quantum silicon photonics technology platform, the quantum silicon photonics team at CEA-Leti, Grenoble, France is looking for a PhD student to develop integrated superconducting single photon detectors on silicon.

Quantum information processing turns out to be a major challenge for our society and generates intensive research at the international level. Large research efforts focus on the development of a quantum computer, able to solve complex problems much more rapidly than a classical computer. Quantum communications are also strategic as they provide absolute security of information transfer thanks to the law of quantum physics and are therefore not vulnerable to the computing power. The second quantum revolution has already started as these concepts are being brought out of laboratories into concrete applications. For this purpose, the development of integrated technologies is essential for the future large-scale deployment of compact and low-cost quantum information systems.

Single photons are an excellent physical implementation for quantum communications. Three key functionalities are required: a bright source of single photons, a fast reconfigurable circuit for their manipulation and an efficient single photon detector. These components are the building blocks of complex emission/reception integrated circuits designed for the implementation of quantum communication protocols.

CEA-Leti has been developing for several years a silicon photonics platform, providing integrated components and circuits for various applications such as telecom, datacom, lidars and more recently quantum communications. A first generation of non-linear source of photon pairs and of superconducting single photon detectors on Si are currently under development.

The objective of this PhD is to design, fabricate in the Leti clean room and characterize a new generation of advanced single photon detectors featuring above 90% efficiency at telecom wavelength thanks to the use of better performing superconducting material. These detectors will then be integrated into quantum communication circuits for the implementation of advanced protocols.

This PhD will benefit from collaborations with academic laboratories in France and in Europe.

Profile of the candidate: We are looking for a highly-motivated student with strong background in optics, photonics and solid-state physics. Skills in cryogenics, nanofabrication or optical simulations would be an asset.

Starting date: October 2020 (flexible)

Contact: Please send your resume and the name of 2 referees to Ségolène OLIVIER, segolene.olivier@cea.fr, CEA-Leti, Department of Optics and Photonics, Laboratory of photonic integration on Silicon.