

# Enabling the next generation of superconducting nanowire single-photon detectors for quantum photonic sensing applications

From quantum optics to LIDAR, from quantum computing to particle detection, SNSPDs are applied in a variety of fields and help push the boundaries of science and technology.

Superconducting nanowires single-photon detectors (SNSPDs) have shown unmatched performances for the detection of telecom wavelength single-photons, with detection efficiency  $> 95\%$ , timing resolution  $< 20$  ps and count rate above 200 MHz. SNSPDs have been already employed in several fields of research such as quantum key distribution, optical bio-imaging, LIDAR to just name a few.

In the last years, the push for the development of optical quantum computers by several research laboratories and startups worldwide has propelled the interest into SNSPDs and stimulated even more the research in the field.

## What you will do with us

The objective of this project is to expand the frontier for SNSPDs applications by creating novel designs and architectures. The project will also heavily focus on the development of new fabrication processes to improve state-of-the-art performances. The detectors will then be characterized in our state-of-the-art cryostats and ultimately used in real experiments, here at the university or in collaboration with other institutions. We envision the possibility to explore new read-out schemes, based on cryogenic electronic or even superconducting circuits.

The ideal candidate is capable of taking initiative to drive projects and quickly solve technical problems by drawing from a proven track record of past experiences. As a forward-looking problem solver, you will be able to explore and deliver creative solutions. You have strong communication skills, both with your colleagues and with external members. You have an open mind, positive attitude and you are an avid learner with the desire and ability to have a strong impact on the research of the group.

## What we will do for you

We offer a fully funded PhD position at University of Geneva, in a highly international and friendly working environment, with a competitive salary and 6 weeks of paid vacation. You will have access to state-of-art laboratories (at University of Geneva) and cleanroom (at EPFL). As a researcher you are expected to publish your original research in peer-reviewed journals, and you are encouraged to participate in major international conferences. We have a strong collaboration with a market-leading company in the field of SNSPDs (ID-Quantique), and you will have the possibility to interact with several members of their team.

## Who you are

- You hold a master's degree in physics, nano or micro-technologies, material science or electronic engineering or equivalent.
- You have a some background in (or a strong motivation to learn) nanofabrication techniques, including:
  - Electron-beam lithography
  - Optical lithography
  - Dry/wet etching
  - Evaporation
  - Sputtering deposition
  - Metrology (SEM/AFM/Ellipsometry/Electrical measurements)
- Some knowledge of RF electronics will be considered a plus.
- Additional experience considered as a plus:
  - Coding in Python
  - Experience in cryogenic measurements
  - Experience in quantum optics
- Autonomous and capable of working in a dynamic environment, alone or within a team
- Fluent in English, both speaking and writing. French is considered a plus.

## How to apply

Please email your CV and a short motivation letter (~1 page) directly at [giovanni.resta@unige.ch](mailto:giovanni.resta@unige.ch). We look forward to getting to know you and your interests.

## General information

**Laboratory:** *Quantum technology group at University of Geneva*

**Type of work:** *40% Cleanroom (SNSPD fabrication), 30% testing, 10% develop new designs, 20% teaching and communication*

**Required background:** *Material Science, Physics, Electrical Engineering or Nanotechnology*

**Supervisor:** *Hugo Zbinden and Rob Thew*

**Daily advisor:** *Giovanni Resta*

**Location:** *UniGe and EPFL (CMi)*

**Starting date:** *September 2022*

**Contacts:** [giovanni.resta@unige.ch](mailto:giovanni.resta@unige.ch)