Low-cost Cryogenic Infrastructure

Supervisor: Dr Gregor Taylor
Co-supervisor: Professor Edoardo Charbon

Introduction

The superconducting technology section of the Advanced Quantum Architecture Lab (AQUA-EPFL) works on superconducting nanowire single-photon detectors (SNSPDs) and superconducting digital logic families such as rapid flux quantum (RSFQ). We aim to develop exquisitely sensitive single-photon cameras, with low false counts, precise timing resolution and a spectral sensitivity that spans from the ultraviolet, all the way to the far-infrared. We also develop superconducting logic circuitry, that allows beyond-CMOS capability, with clock speeds of order 100's of GHz, and power consumption orders of magnitude below CMOS alternatives. We apply these circuits to a range of problems from data and image processing of superconducting photon sensors, to the control and readout of Qubits.

In Brief

We seek a motivated semesters project candidate to work with us to develop low-cost electronics for the control of cryogenic infrastructure. Cryogenics is prohibitively expensive for many research groups world-wide and the development of low-cost, open source alternatives to electronics module used for the temperature control and cooldown control would be a good step on the road to more wide-spread cryogenic experiments.

Detailed Objectives

The goals of the project will be:

- Develop electronic circuits to readout and control commercial cryostats based on Gifford-McMahon and Pulse-Tube type cryocoolers, as well as sorption style coolers capable of achieving temperatures less than 1 K.
- Develop mechanical components to interface apparatus to the cryostat.
- This semester project will involve Python development, PCB and circuit development as well as microcontroller (and potentially FPGA) work.

The candidate will gain experience in cryogenics, experimental design and practical experience in the development of instrumentation.

For more information and to apply, please contact Dr Gregor Taylor
gregor.taylor@epfl.ch

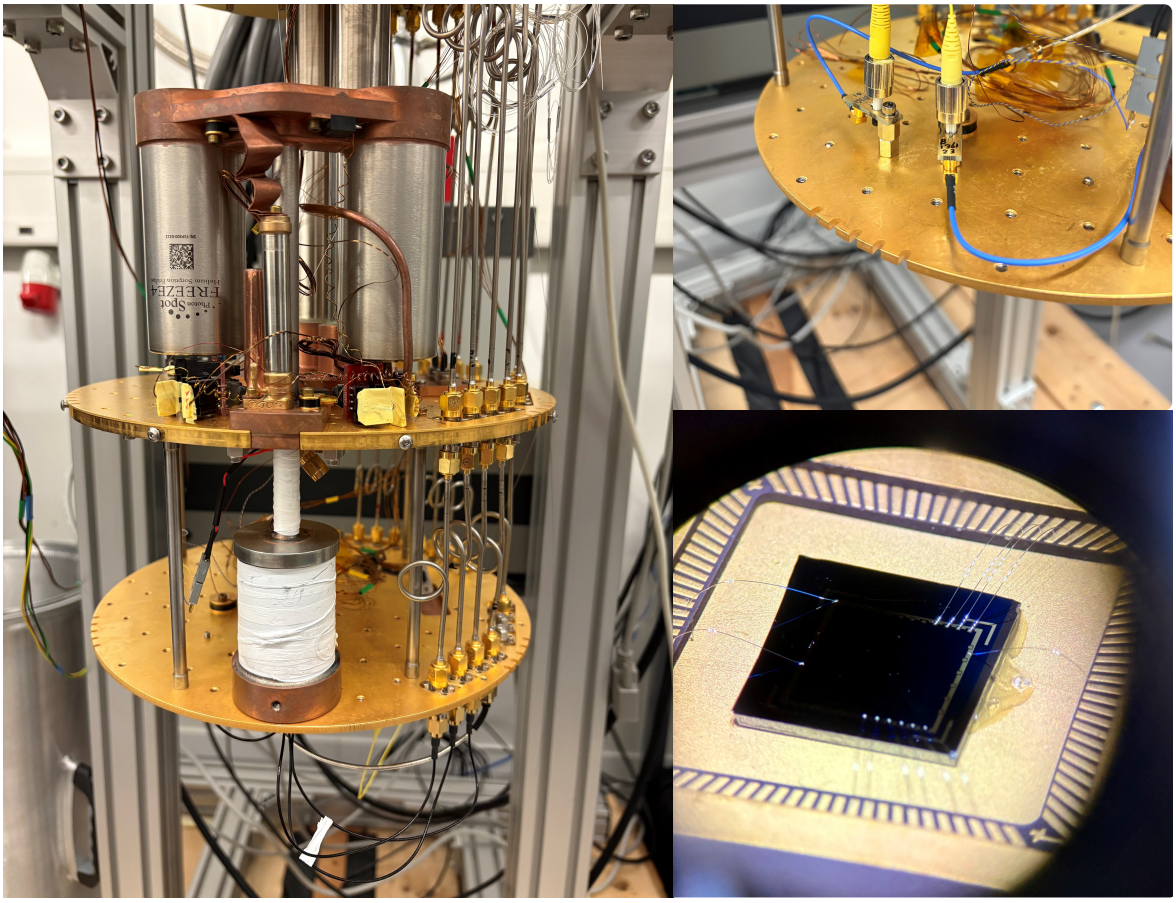

Figure 1: Cryogenic infrastructure within the AQUA lab.