Thesis proposal - high-density wirebonder-free chip-to-pcb transitions for quantum computing

Background
The quantum technology laboratory (QTL) is doing research on quantum computing using superconducting qubits. We manufacture chips in the MC2 state-of-the-art cleanroom and then mount and investigate their properties in our cryogenic lab. Mounting the chips in the cryostats involves wirebonding the chip to a sample holder. A time-consuming and complicated task. In this project we want to investigate the possibility to build a beam-like connector to connect the chip to the sample holder. This device needs to support frequencies up to about 10 GHz and must be compatible with the cryogenic environment.

Thesis outline
In this thesis you design and manufacture a prototype of a microwave transmission system for use in a cryostat at 10 mK temperature. The transmission system needs to have low loss, high density and be compatible with the requirements of quantum computers in a cryostat.

Tasks:
1. Literature review of packaging of quantum processing units
2. Design of a beam PCB-chip transition
3. Manufacturing of the prototype
4. Measurement of the prototype
5. Thesis writing and presentation

Candidate background and experience
We think you have a background in engineering physics or electrical engineering with a focus on microwave engineering. Experience with microwave simulation tools such as HFSS, Comsol, ADS, MWO are meriting. Understanding of microwave design is meriting. Knowledge in PCB design tools such as KiCAD is meriting. Knowledge in mechanical design and simple mechanical calculations for deforming structures is meriting.

Career opportunity
SCALINQ is a spin-off from the research in the QTL. SCALINQ develops microwave equipment for quantum computing applications. Their solutions are used to package and shield quantum processing units (QPUs) built on superconducting (SC) technology when the devices are mounted in a cooling cryostat. SCALINQ today has the world leading package solution, named LINQER, in terms of number of microwave control signals as well as performance, such as crosstalk.

The thesis will be carried out in close collaboration with SCALINQ and we hope the successful candidate will continue working for SCALINQ or in the QTL lab after the project has finished.

More information
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Project dates
Start spring 2023 or earlier depending on candidate availability