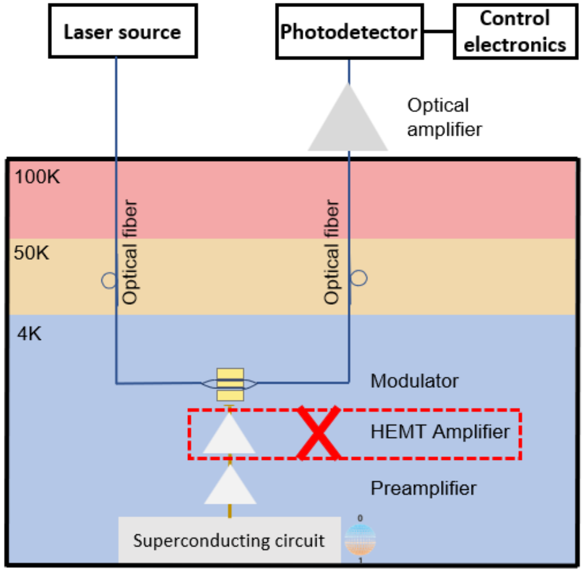
Master Thesis:

Design and cryogenic testing of superconducting resonators

Next-generation technologies like quantum computing and superconducting circuits enable faster data processing and advanced computing. Data transfer between cryogenic and room-temperature electronics relies on cryogenic interconnects, which can be optimized using optical fibers. This approach involves upconverting cryogenic microwave signals into the optical domain via sensitive optical modulators for transport through optical fibers.

However, such an optical cryogenic interconnect requires a very sensitive optical modulator to upconvert the low-voltage cryogenic signals. Enhancing modulator sensitivity can be achieved by embedding a traveling/wave EO modulator within a microwave resonator. To minimize RF losses, the resonator can be made of a superconducting material.

The goal of the thesis is to design a transmission-line microwave resonator and identify the key design parameters for optimum performance. The final resonator design should be used to generate a layout file for fabrication. The fabrication can then be done in the KIT cleanrooms. Subsequently, the fabricated design should be measured in the cryostat, in order to compare the semiconductor material properties used in simulation to those of the measured device.



Tasks:

- Design and simulation (using CST Studio) of a superconducting transmission-line microwave resonator
- Design of the chip layout (GDS file) for fabrication
- Characterization of the electrical properties of the fabricated resonator in a cryostat
- Experimental verification of the semiconductor material properties used in simulation

Interested? Please contact:

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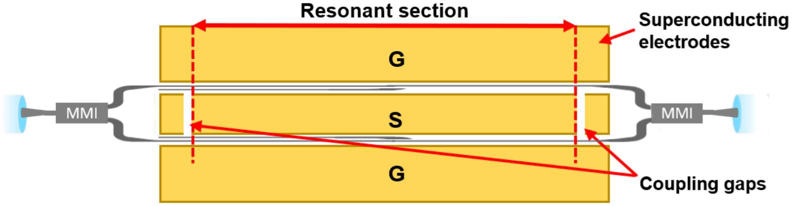

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