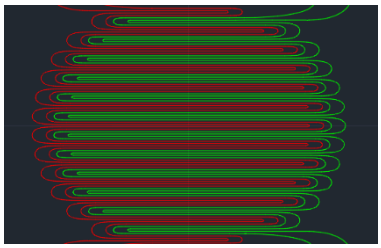
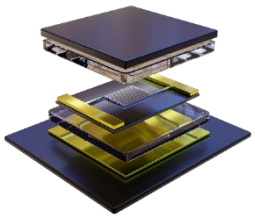
Master thesis on Superconducting Nanowire Single-Photon Detectors (SNSPDs)





Superconducting nanowire single-photon detectors (SNSPDs) are a crucial building block for the realization of future photonic quantum technologies. Within the last years, they have proven to be one of the most versatile detectors for visible to infrared wavelengths, as they outperform other single photon detectors in terms of high detection efficiencies (>90%), high count rates, low dark count rates (<1 Hz), and high timing resolution (<20 ps) [1]. Thus, these detectors have a wide range of applications such as general faint light detection in astronomy or integrated on-chip photonic circuits for future chip-based optical quantum applications.

The research in our group

In our research group we aim at optimizing the detector performance and develop concepts for the scalability of single-photon detectors [2, 3, 4]. The research group is a collaboration between the groups SNQS (Walter Schottky Institute) and the QEC (Electrical Engineering). The nanofabrication of the detectors is performed in the clean room facility of Center for Nanotechnology and Nanomaterials (ZNN).

Open working topic

Development of new geometries for the scalability of detectors, working on the on-chip design of multi-pixel SNSPDs, based on the approach of interleaved superconducting nanowires.

What you'll be doing

- Simulation (COMSOL) of electrical response using novel detector geometries
- Nanoscale clean room fabrication process (electron beam/optical lithography, etching, imaging, etc.)
- electro-optical measurements at cryogenic temperatures
- Working with advanced software for measurements and designs

Relevant skills

- Personal motivation and commitment to this fascinating project
- Team work, you will work closely together with a team of students and Ph.D. students
- Experience in the areas of simulation, electronics, programming or cleanroom fabrication is beneficial

Applications

Please send your CV, transcript of records and Bachelor thesis to Prof. Jonathan Finley (finley@wsi.tum.de) and Prof. Kai Müller (kai.mueller@wsi.tum.de), including Sven Ernst (sven.ernst@wsi.tum.de) and Stefanie Grotowski (stefanie.grotowski@wsi.tum.de) in cc.

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[1] I. Holzman et al., Advanced Quantum Technol. **2**, 1800058 (2019)
[2] R. Flaschmann et al., Nanoscale,15, 1086-1091 (2023)
[3] arXiv:2207.12060
[4] Jia Huang et al. Supercond. Sci. Technol. **31** 074001 (2018)