Lennart Bours

Supervisor: Francesco Giazotto

Passaggio d'anno 2019

National Enterprise for nanoScience and nanoTechnology

NEST

Passaggio d’anno 2019

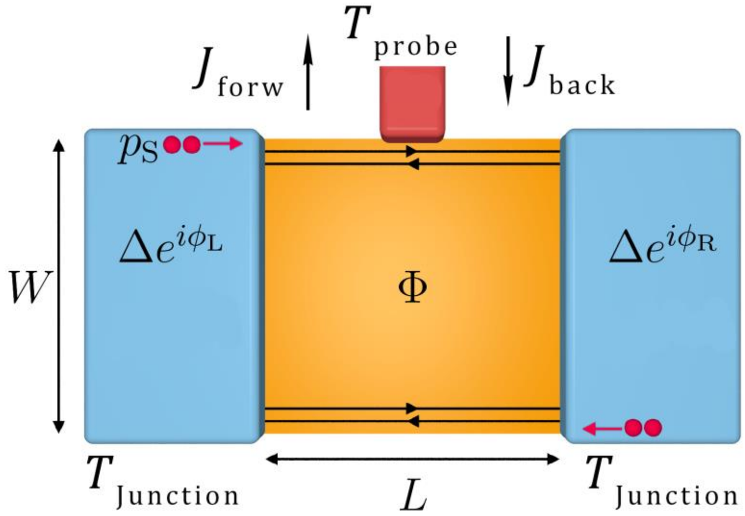
PhD track: Nanoscience

PhD topic: Investigating heat transport in novel solid state elements

Project on Topological Insulators in collaboration with prof. Molenkamp; university Würzburg

Projects 2018 - 2019

- Second theoretical article: **thermal characterization of the TSQUIPT**



PHYSICAL REVIEW APPLIED **11**, 044073 (2019)

Phase-Tunable Thermal Rectification in the Topological SQUIPT

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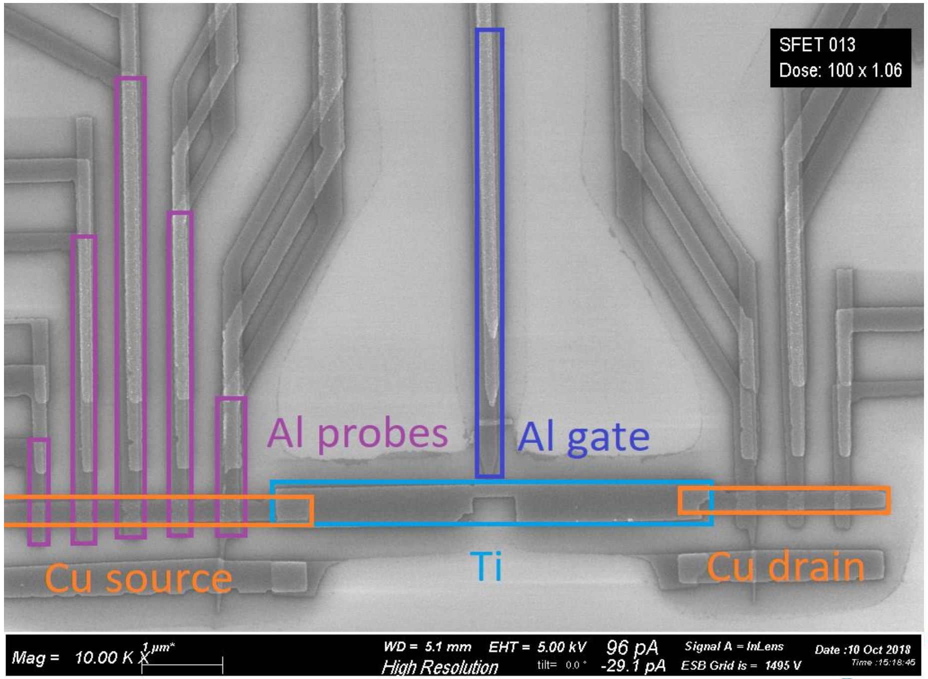
We theoretically explore the behavior of thermal transport in the topological SQUIPT, in the linear and nonlinear regime. The device consists of a topological Josephson junction based on a two-dimensional topological insulator in contact with two superconducting leads, and a probe tunnel coupled to the topological edge states of the junction. We compare the performance of a normal metal and a graphene probe, showing that the topological SQUIPT behaves as a passive thermal rectifier and that it can reach a rectification coefficient of up to 145% with the normal metal probe. Moreover, the interplay between the superconducting leads and the helical edge states leads to a unique behavior due to a Doppler-shift-like effect that allows one to influence quasiparticle transport through the edge channels via the magnetic flux that penetrates the junction. Exploiting this effect, we can greatly enhance the rectification coefficient for temperatures below the critical temperature T_C in an active rectification scheme.

DOI: 10.1103/PhysRevApplied.11.044073

Projects 2018 - 2019

Experiment:

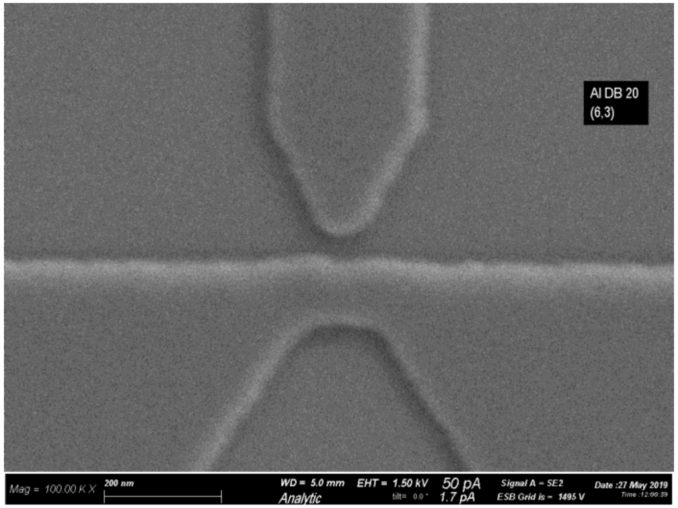
- heat transport through a Superconducting Field Effect Transistor



Projects 2018 - 2019

Experiment:

- Field effect in Titanium and Aluminium Dayem bridges
- Combined with magnetic fields
- An extension of previous works done in our group



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Future Projects

- Article: Finish measurements on aluminium Dayem bridge and write article
- Experiment: Heat transport on HgTe?
- Experiment: retry heat transport through superconducting field effect transistor

Thank you for your attention