Bachelor Thesis Project: Superfluid anisotropies detected by microwave directional antennas

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THE PROJECT

The group of Prof. C. Strunk offers a **bachelor thesis project** on the **setup of an experiment combining a dipole antenna and standard millikelvin transport measurements.**

The goal

The goal of the thesis is to design and to possibly realize an experiment where the kinetic inductance of a 2D superconductor can be influenced by the near-field radio-frequency irradiation by a dipole antenna. The crucial point here is to **rotate** the dipole with respect to the sample.

Why is that interesting?

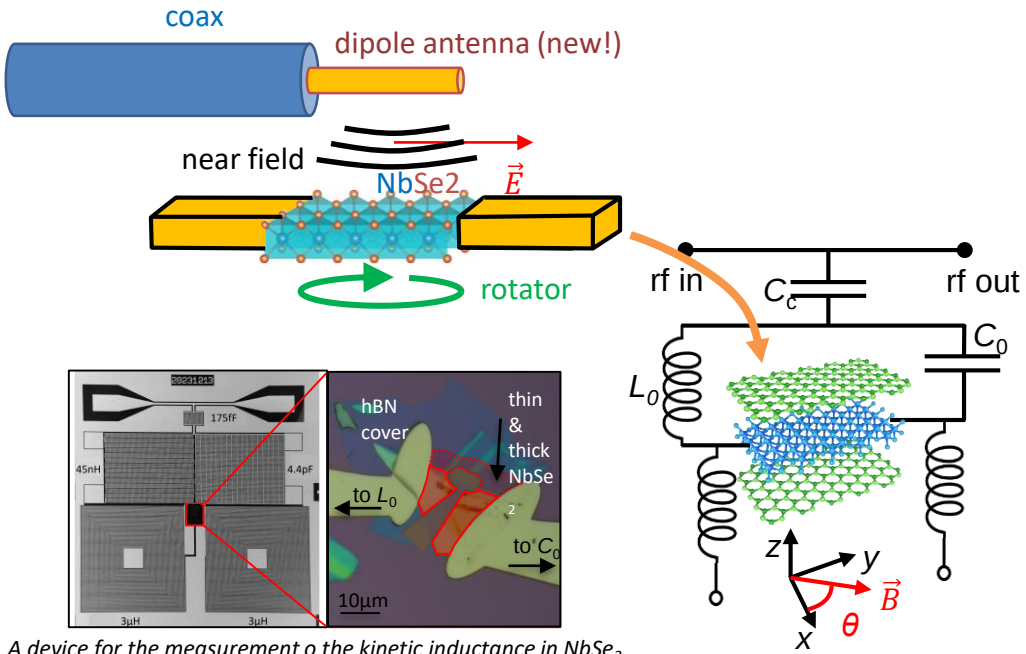
In mono-crystalline 2D superconductors, the electronic superfluid characteristics depend on the direction with respect to the crystal axes. One of these characteristics is the order parameter, which can be directly measured by **inductance measurements**. Usually, the excitation needed to measure inductances is provided via contacts on the sample. The obvious drawback is that the orientation of the current with respect to the lattice is fixed, and cannot be continuously changed.
The dipole antenna provide a way to freely rotate the (pick-up) current excitation. The fixed contacts will still be use to detect the inductance, but the perturbation is provided by the antenna.

What you will learn/What you will do

There are two options for this Bachelor project:

- If you are more interested in analysis and simulations, you could use finite-elements based simulation software to design the best geometry for the experiment

- If you are more interested in lab work, you could then implement the antenna experiment in one of our cryostats.



A device for the measurement o the kinetic inductance in $NbSe_2$