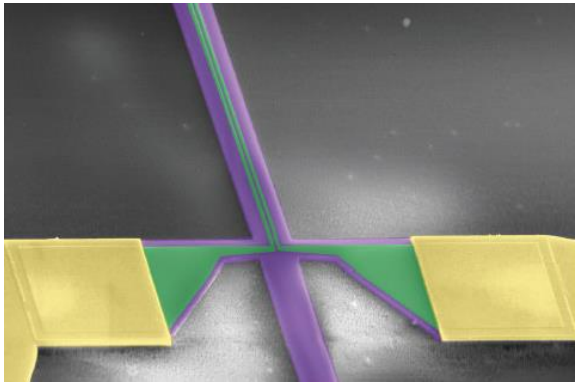
WWU MÜNSTER

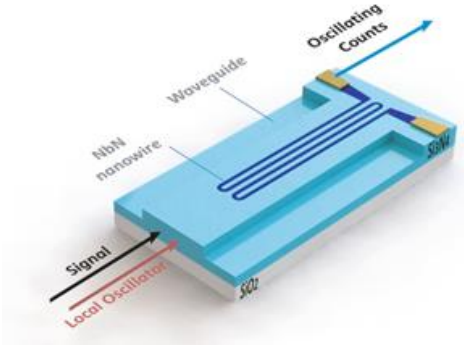
MÜNSTER NANOFABRICATION FACILITY

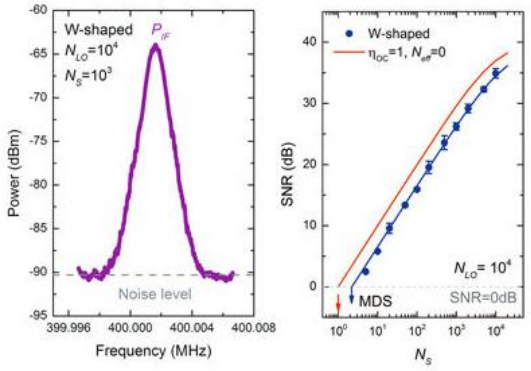
CeNTech CENTER FOR NANOTECHNOLOGY

Master Thesis: **Ultra-high resolution on-chip single-photon spectroscopy**

On-chip wavelength measurement with quantum limited sensitivity, i.e. being able to determine the wavelength of a single photon, represent a fundamental challenge for characterizing single photon emitters and sources and for quantum communication. On-chip spectrometers, such as arrayed waveguide or Echelle gratings, have been proposed for this purpose, but they are bulky and have limited resolution and sensitivity. Alternative solutions are therefore necessary.
In the group we realize highly efficient on-chip superconducting nanowire single photon detectors and recently showed that we can use these devices for extremely weak signal spectral characterization using a heterodyne mixing configuration. Heterodyne mixing consists of combining an unknown signal with a well characterized local oscillator to determine the original signal wavelength. We are now interested on improving this technique and apply it to characterize the spectral emission of single photon emitters off- and on-chip.
The **project** comprises: design, realization and characterization of photonic circuitry and superconducting nanowire single photon detectors, as well as the optimization of a cryogenic measurement setup for the characterization of single photon emitters.
During **your activity** in our group you will be introduced to our circuitry design software, our state-of-art cryogenic setup, our new cleanroom environment and all the nanofabrication tools you will need for realizing and testing your devices.
English language and basic Python programming skills are desirable, but we mainly ask you to **share with us your curiosity and passion** an interesting topic.







References:
Scientific Reports 7, 4812 (2017)

For further information, please, contact:
Simone Ferrari simone.ferrari@uni-muenster.de
or Prof. Dr. Wolfram Pernice wolfram.pernice@uni-muenster.de
https://www.uni-muenster.de/Physik.PI/Pernice/
https://www.uni-muenster.de/MNF/