SNI SWISS NANOSCIENCE INSTITUTE
EINE INITIATIVE DER UNIVERSITÄT BASEL UND DES KANTONS AARGAU

University of Basel

van der Waals 2D semiconductor nano-structures with superconducting contacts

The full experience:
electron-beam nano-fabrication, mK cryogenics, high-resolution quantum transport experiments, data analysis and modeling in a great social and intellectual environment

Main proposer and contact: Dr. Andreas Baumgartner,
andreas.baumgartner@unibas.ch, Department of Physics, University of Basel

Co-proposer: Prof. Dr. Christian Schönenberger,
Department of Physics, University of Basel

Project description:

In this project we will combine two-dimensional van der Waals semiconductors [1,2] and electron-beam nanostructuring to engineer low-dimensional (2D, 1D, 0D) quantum transport devices with superconducting contacts. The aim is to develop a platform for scalable and flexible (design) superconducting electronics to investigate and exploit fundamental phenomena like spin-orbit interaction, Cooper pair splitting [3,4], Majorana bound states [5] and Parafermions [6].

This position requires a strongly motivated, independent experimentalist, preferably with a background in nanoscale lithography, electron transport experiments, cryogenics or material sciences. You will work in a very supportive group (www.nanoelectronics.ch) and in the strongly interdisciplinary environment offered by the SNI (www.nanoscience.ch).

The Nanoelectronics group is leading in research on electron, Cooper pair and spin transport in semiconducting nanowires, carbon nanotubes, graphene and other low-dimensional materials. This know-how we now want to apply to 2D semiconductor systems to exploit the exciting properties of van der Waals crystals in cutting edge quantum transport experiments. In addition to the already existing state-of-the-arts facilities, we are right now setting up a new fabrication laboratory dedicated to 2D materials.

References (see also www.nanoelectronics.ch):
[1] K.S. Novoselov *et al.*, Science 353, 461 (2016)
[2] S. Manzeli *et al.*, Nature Mat. 2, 17033 (2017)
[3] L. Hofstetter *et al.*, Nature 461, 960 (2009)
[4] J. Schindele *et al.*, Phys. Rev. Lett. 109, 157002 (2012)
[5] V. Mourik *et al.*, Science 336, 1003(2012)
[6] J. Klinovaja and D. Loss, Phys. Rev. B 90, 045118 (2014)