

## Bachelor thesis

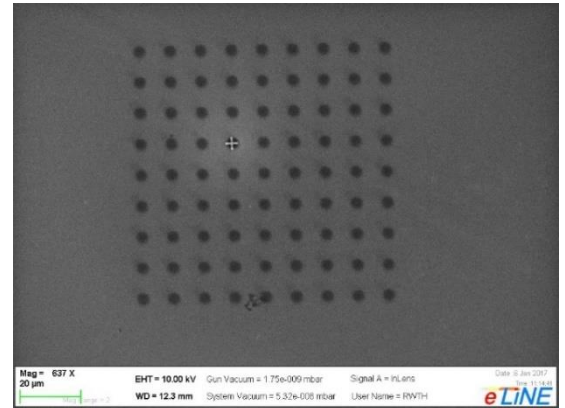
### Ultrahigh Vacuum Mask Aligner: Integration and Electronic Readout

With the long term ambition of detecting **Majorana excitations**, we aim at evaporating superconductors with pierced holes onto a topological insulator. This structure is produced by depositing the superconductor through a **shadow mask** (top figure). The goal is an in-situ process which creates an array of pierced holes and keeps the interface free of resists or residues. Therefore, a **mask aligner** (bottom figure) approaches the mask towards the sample with nm precision and, in addition, controls the angle of the mask towards a parallel orientation to the sample surface within an **ultrahigh vacuum (UHV)** chamber. Three **capacitive sensors** within the mask are used to control the sample-mask alignment and piezo-drives are used for positioning.

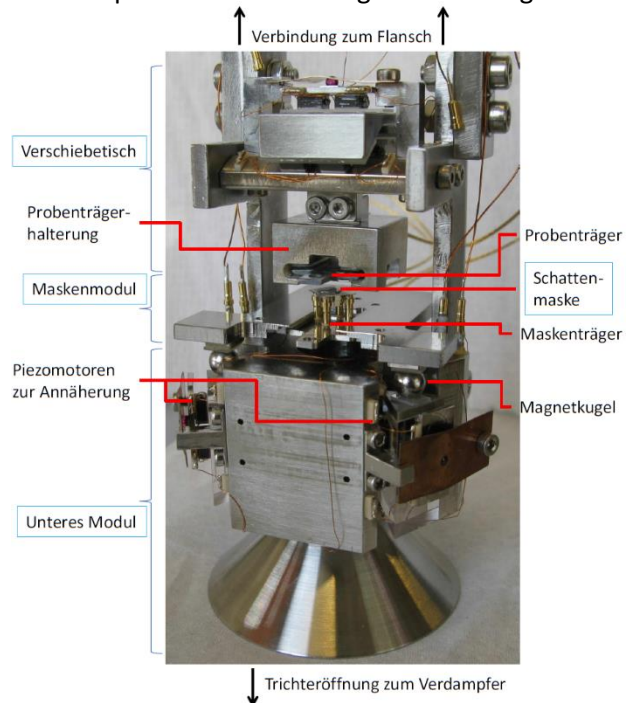
Within the **bachelor thesis**, you will **integrate** a working mask aligner (bottom figure) into a UHV chamber including evaporation tests cross-checked by **atomic force microscopy**. Moreover, you will assemble an **electronics for capacitance readout**. The goal of the thesis is a functional system transferring the mask structure with sub-100 nm precision to the sample.

**Pre-requisites:** Basic knowledge in electronics, technical understanding, interest in UHV instrumentation, solid **english** for lab communication.

Begin: Spring 2017 / ASAP



Electron microscopy image of gold circles (diameter 3micrometer) evaporated through a patterned mask using the mask aligner



Photograph of the mask aligner with labeled parts

If you are interested, please contact Priyamvada Bhaskar (Rm. 28 A 325)  
[bhaskar@physik.rwth-aachen.de](mailto:bhaskar@physik.rwth-aachen.de) or 0241-80-27099.