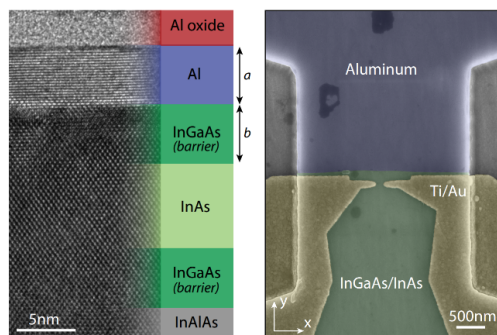




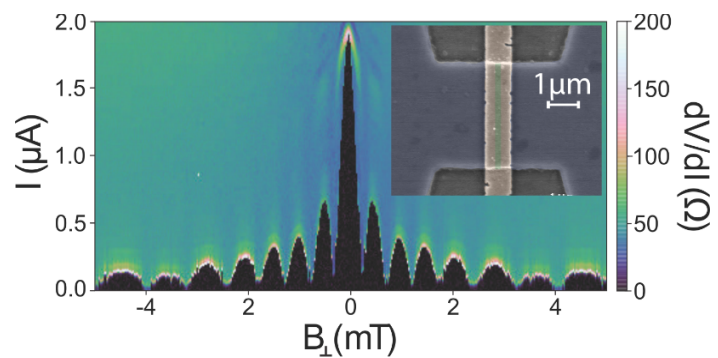
Bachelors and Masters Student Projects: Topological Superconductivity in 2D Electron Gases

Center for Quantum Devices, Station Q Copenhagen

Classifying materials by topology rather than symmetry is the condensed matter paradigm of the century. **Topological superconductors** are a new class of materials, expected to hold a superconductive gap in their bulk and protected states at their boundaries. These states are called **Majorana modes**, and are attracting an enormous experimental and theoretical interest. So far, the main building block for Majorana modes experiments have been 1D nanowires.



Left. Transmission electron micrograph of the cross-section of one of our samples. Note the ordered atomic structure at the interfaces. **Right.** Scanning electron micrograph of a complete sample. A quantum point contact (yellow) faces a semiconductor-superconductor.



Resistance of a superconductor-2DEG-superconductor junction (also called Josephson junction, see inset) as a function of magnetic field and electrical current, measured at a temperature of 30 mK. Dark regions indicate a zero resistance state (supercurrent).

Our research objective is to take topological superconductors to the new dimension by developing a 2D platform for creating, studying and manipulation Majorana modes. Our playground is two-dimensional electron gases (2DEGs) embedded in materials with very strong spin-orbit interaction, strongly coupled to superconducting metals.

We are looking for motivated bachelor and master students to side us in our research. During your stay you will be involved in nano fabrication of devices, electrical measurements at cryogenic temperatures, data analysis and much more. Our interest ranges from studying fundamental properties of matter to using Majorana modes for quantum computation.

If you are interested in getting involved with our research, or if you want to know more, do not hesitate to contact Fabrizio Nichele (fnichele@nbi.ku.dk) or Charles Marcus (marcus@nbi.dk).