Master's thesis: Cryogenic measurements and modeling of electrical devices

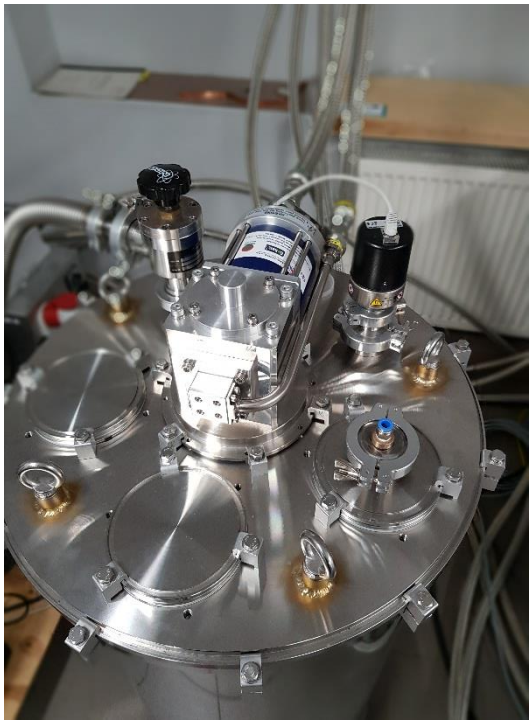

Figure: A liquid helium cryostat used to cool electrical devices down to temperatures of 4 K. ©Commons

There is a growing need for electronics operating at cryogenic temperatures, 4 K and below. Applications include space astronomy, physics experiments and not least quantum computers. Electronic circuits and devices, such as amplifiers, are cooled either for latency reasons, by facilitating tight integration with other circuitry, or to reduce the level of noise that they generate. There is thus a need to understand how the behavior and characteristics of such circuits and devices change as they are cooled to cryogenic temperatures. Not only can this help us design efficient electronics by predicting impedances and performance, but we may also find novel ways of using this change in behavior to our advantage.

In this master thesis project, the aim is to examine the behavior of electrical devices, transistors and circuits, as they are cooled down to cryogenic temperatures. The project includes the following key elements:

- Electrical measurements at cryogenic temperature, 4 K and above, of our inhouse transistor technology

- Modeling of electrical behavior to understand the unique effects present at these temperatures

- Both DC and high-frequency measurements

The Materials Integration and Nanoscale Devices (MIND) group has extensive experience in nanoelectronics research as well as cryogenic measurements, providing a strong infrastructure for a successful research project. The project is available immediately for a minimum duration of six months in a collaborative group at the IBM Research Zurich laboratory.

Please note, this is a non-remunerated M.Sc. thesis project, not a funded position.

Requirements

- Applicants are expected to pursue a master's degree in engineering or in electrical engineering, physics, nanoscience
- Must be enrolled as a Master student at ETH Zurich
- Experience with simulation or modeling is a plus but not a must
- Excellent English communication skills
- Be highly motivated, creative and independent

How to apply

Interested candidates please send an application including CV, cover letter and academic transcript to:
Dr. Cezar Zota (zot@zurich.ibm.com).