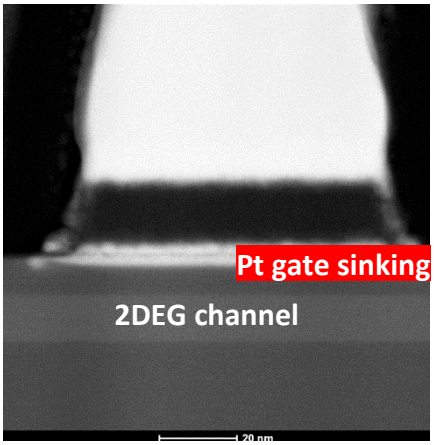
Diploma /MSc work at MC2 – Year 2019

Ultra-low noise transistor technology for GHz detection

Some of the world largest radio telescopes prospected today rely on information around one GHz. We are looking on new transistor designs to improve the sensitivity for such an application. Modern low-noise transistors takes advantage of a gate stack where platinum metal is diffused in close proximity (some atom layers) to the channel where electrons drift in a two-dimensional gas from drain to source at high speed. The challenge lies in how to control the diffusion of Pt without coming too close to the channel. This will increase the gate current which strongly degrades the noise figure of the transistor, the most important property for highest sensitivity.

At MC2, we have been exploring the lowest noise transistor, the so-called InP high-electron mobility transistor (InP HEMT), during many years. In this diploma work, you will test various gate sinking procedures in modern InP HEMT processing in the cleanroom at MC2. You will learn a number of electrical measurements on various devices in the THz laboratory at MC2 to investigate dependencies between process parameters and transistor data from room temperature down to 4 K. In collaboration with a company, Low Noise Factory AB (www.lownoisefactory.com), promising devices will be tested in real microwave amplifiers where gain and noise figure will be measured. This diploma work for the MSc student will therefore provide insight both in transistor fabrication, electrical measurement and low-noise amplifier testing in collaboration with an innovative electronics company in Gothenburg.

Application needing very low-noise transistors



Pt gate sinking close (~nm) to the transistor channel

Contact:

Tekn.lic. Eunjung Cha, eunjung.cha@chalmers.se 0760-72 71 52

Prof. Jan Grahn, jan.grahn@chalmers.se 0730-34 62 99

Terahertz- and Millimetrewave Laboratory, Microtechnology and Nanoscience (MC2), Chalmers