

## **Task the bachelor's thesis in the degree program Electrical and Electronic Engineering (ISE)**

Topic: Investigation and correction des proximity effect in the electron beam lithography process for InP- HBTs

### Task:

To realization of electrical terahertz circuits requirement it active components, the have a sufficiently high cut-off frequency. A promising component for this are heterostructure bipolar transistors based on III/V semiconductors, which currently already have cut-off frequencies from 1.2 THz to reach can. A direct Approach, the cutoff frequency from HBTs To increase the efficiency, the component must be miniaturized. The dimensions of the emitter and the base mesa are particularly important. In order to achieve the smallest dimensions Electron beam lithography ( Eng.: E-beam lithography) is a suitable method , which offers not only a very high resolution but also the necessary flexibility in the structures produced , which is necessary for component development . One factor that limits the resolution of electron beam lithography is the so-called "proximity effect". This describes the influence the electron scattering in the photoresist, which can lead to that surrounding areas in order for the structure to receive a sufficiently large dose of energy in order to also be dissolved in the development step. This results in misshapen and enlarged structures. However, the Proximity effect can be compensated by simulating the scattering of electrons and the results of the simulation in the calculation the necessary dose per area unit with included become.

The aim of the work is to produce emitter structures with a diameter of 300-350 nm using electron beam lithography. For this purpose, it is necessary to carry out a proximity correction. For this proximity correction, the "point spread function" (PSF) of the electron beam certainly become. The PSF soil for the a through Monte Carlo simulations with the programs "Elphy Quantum" and "Beamer" as well as from experimental tests. The determined PSF will then be used to correct the proximity of the emitters and, if possible, base structures be carried out. The thus produced Structures are by means of a scanning electron microscope should the proximity correction and the write parameters the electron beam lithography on base the first Results improved.