

# Semester Project

Millimeter Wave Electronics Laboratory, D-ITET

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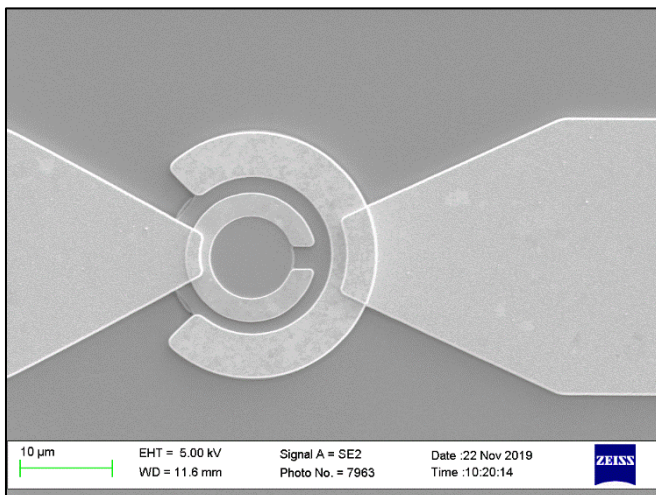
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## Simulation of High-Speed III-V Photodiodes

### Vision

Photodiodes (PDs) play a crucial role in high speed fiber-optic and wireless communication systems. Semiconductor heterostructures based on the elements of group III and V build the basis for wideband and high power photodiodes (eg: PIN-PDs and UTC-PDs).

The development of such high-speed photodiodes involves optimization of the semiconductor epitaxial layers as well as the device fabrication.



SEM image of an InP based photodiode fabricated in the MWE-lab.

The experimental determination of the influence of different parameters like material composition, layer thickness and doping on the DC and RF performance of a photodiode requires considerable time and financial resources. Thus, device simulations are needed to give an idea about the implications of these parameters.

### Thesis Description

The goal of the project is to perform DC and RF simulation for InP based photodiodes using the commercial device simulator SILVACO ATLAS. This project requires understanding the underlying physics and operation of the III-V photodiodes, as well as analysing the DC and RF figures of merit.

### You will

- Gain insight into the photodiode device structure, and possibly the fabrication process flow.
- Understand the figures of merit for modern high speed photodiodes.
- Get to know the simulator and understand the parameters involved in modelling the photodiodes.
- Investigate the influence of various epitaxial designs in the absorber and collector regions of the PDs.
- Suggest an optimized photodiode epitaxial design and make a fabrication proposal.

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