

# Development of an End-to-End Simulation Setup for 5G Networks

## Bachelor's Thesis

### Project

The evolution of mobile communication standards approximately every decade necessitates continuous research and development efforts to stay at the forefront of technological advancements. In the realm of mobile communication, simulations play a pivotal role, especially in the early stages of development when hardware may not yet be available, could be prohibitively costly, or when field testing is not feasible due to regulatory constraints. Simulations are particularly crucial in security analysis, where executing real attacks could compromise the functionality of mobile devices and disrupt public communication networks, which is unacceptable.

This thesis aims to design and implement a comprehensive end-to-end simulation framework that integrates srsRAN (a software radio access network for 4G and 5G) with GNU Radio (a software-defined radio toolkit). The project will start with acquiring a foundational understanding of 5G networks and their components. Subsequently, you will configure the srsRAN setup and establish its connection with GNU Radio. The primary task within GNU Radio will be to create a simulation environment that mirrors the complexities of real-world radio access networks.

The simulation environment should encompass various models to represent different geographical and urban contexts, such as Rural areas and Urban centers.

### Tasks

1. Create and configure the simulation setup
2. Implement the channel models
3. Automate scenario building

### Requirements



Study electrical engineering, computer science, mechatronics, or comparable.

- ✓ Programming in C++ or Python.
- ✓ Knowledge of Software Defined Radio (SDR) is an advantage.
- ✓ Knowledge of mobile communications is an advantage.

### Institute

#### Communications Engineering Lab

Hertzstr. 16  
Gebäude 06.45  
76187 Karlsruhe  
[www.cel.kit.edu](http://www.cel.kit.edu)

### Contact

#### M.Sc. Jonathan Ebert

Room 203  
[jonathan.ebert@kit.edu](mailto:jonathan.ebert@kit.edu)