

TU Berlin | Straße des 17. Juni 135 | 10623 Berlin

#### Bachelor/Master Thesis:

# Design of a >10 GHz Wideband Variable Gain Amplifier (VGA) in 22nm

The VGA is an essential connecting part between the downconversion mixer and the ADC in a wireless receiver. Its main purpose is to provide a constant full-scale signal input to the ADC while achieving sufficient controllable gain for varying receiver input power.

Future wireless technologies such as 6G will require extremely wide bandwidths (>10 GHz) to enable high data transmission. This poses various challenges to the receiver components such as LNA, mixer, VGA and ADC. This thesis focuses on the design of the VGA, which sits between a high speed-ADC (>20 GS/s) and a D-band (150 GHz) down-conversion mixer. Besides adding low noise to the input band, the main challenge is to enable high linearity performance with output compression above +5dBm.

## Goals:

- 1) Researching, analyzing and brief testing all suitable VGA architectures that can fulfill the specification.
- 2) Implementing the most promising designs in schematic level
- 3) Performance comparison

## Stretch Goals:

4) Layout and post-layout analysis (master thesis)

### **Prerequisites:**

- Good knowledge of integrated analog circuit design (completed AIC or AAIC is sufficient)
- Experience with Cadence Virtuoso
- Basic knowledge in RF (you should know S-Parameters and impedance matching) and Data converters.

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