

## University of Stuttgart

Institute of Robust Power  
Semiconductor Systems

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Bachelor thesis  
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PE

# Power density Optimization of a GaN-based Inverter for Quadrocopters

A quadrocopter requires an inverter to convert the DC voltage supplied by the battery into a variable AC voltage that is needed to drive the motors.

Due to their outstanding electrical properties, such as low switching losses and conduction losses, GaN transistors offer enormous potential for increasing the efficiency and miniaturization of inverters. This enables a more compact design of the inverter with increased efficiency and performance at the same time.

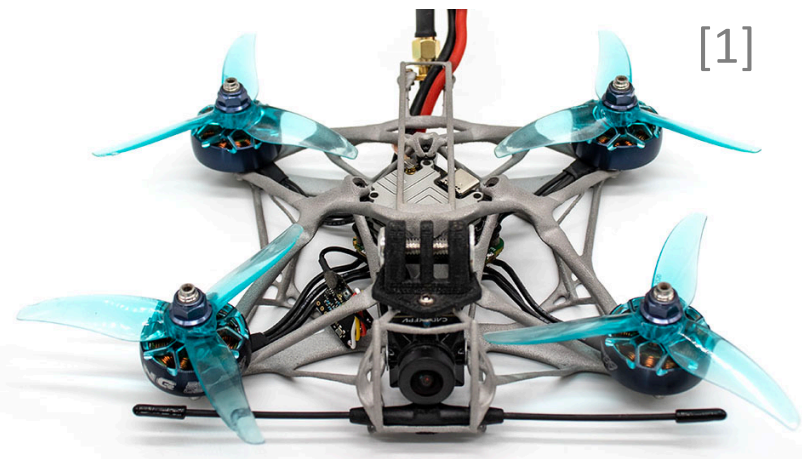
The optimization of the power density aims to maximize the efficiency of this inverter while minimizing the weight and volume to improve the flight performance and payload capacity of the quadrocopter.

By using GaN transistors, conventional silicon-based inverters can be outperformed. Furthermore, reducing the size and weight of the inverter leads to a longer flight time and increased payload capacity of the drone.

The culmination of this work is to optimize the drone for heavy payloads. Among these payloads is an E-band antenna, which makes precise control of the drone essential.

### Scope of Work:

- Definition of the framework conditions for the intended use of the drone (payload)
- (Generative design to optimize the weight → Additive manufacturing of the drone frame)
- Si and GaN based inverter simulation and design
- Test and commissioning
- Electrical efficiency measurement and comparison



[1] <https://tillblaser.ch/en/generative-drone/>