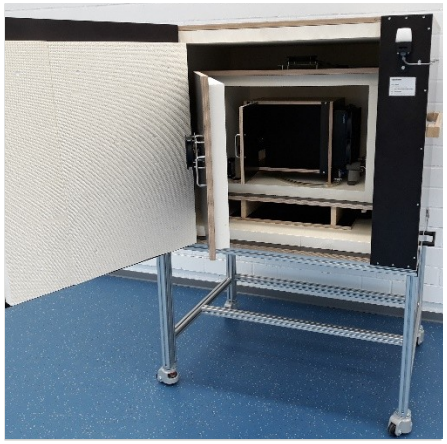
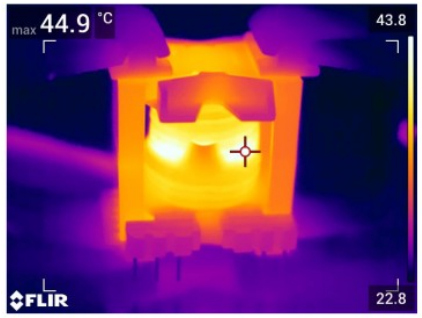
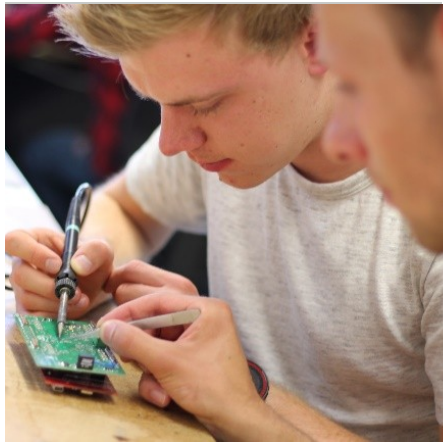
Leistungselektronik und Elektrische Antriebstechnik
Prof. Dr.-Ing. Joachim Böcker





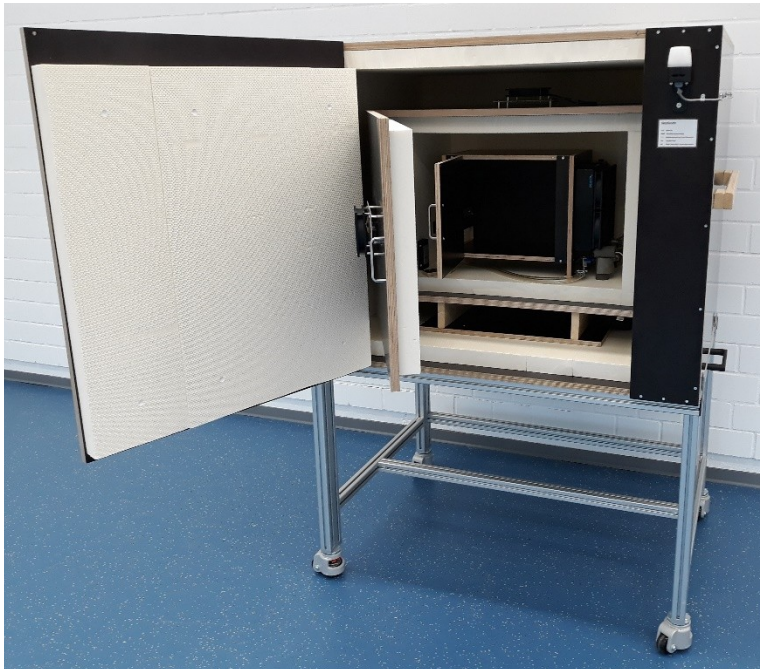


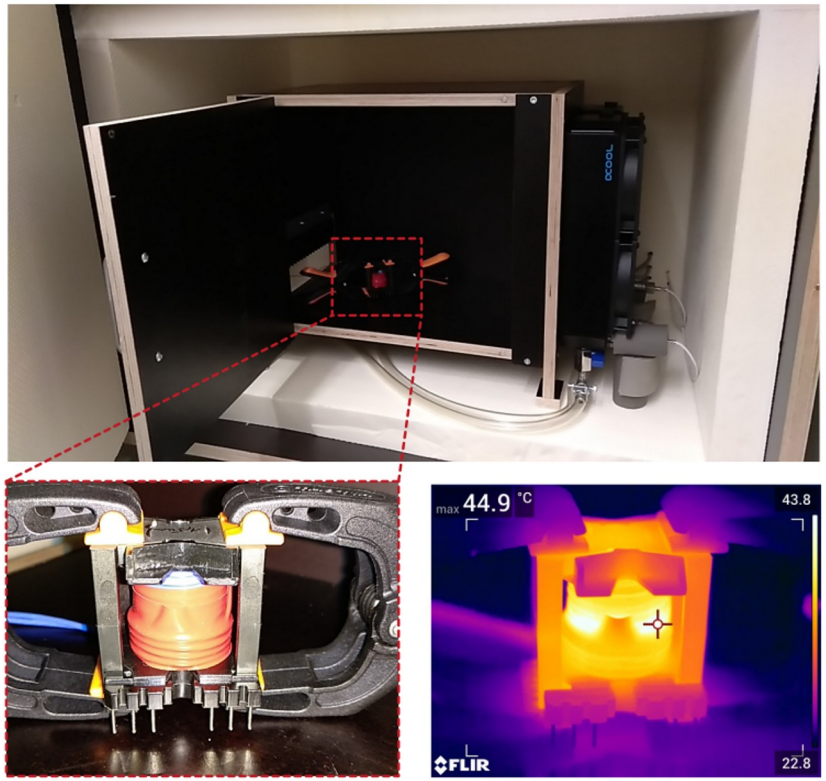
Topic 3: Calorimetric Measuring Chamber Optimization

Improvement of a compensating temperature measurement system

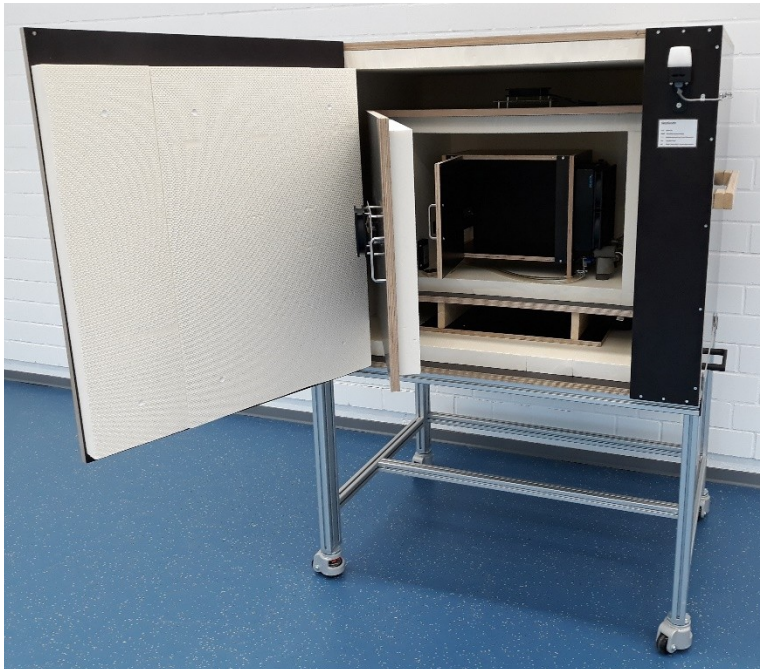
6. April 2023

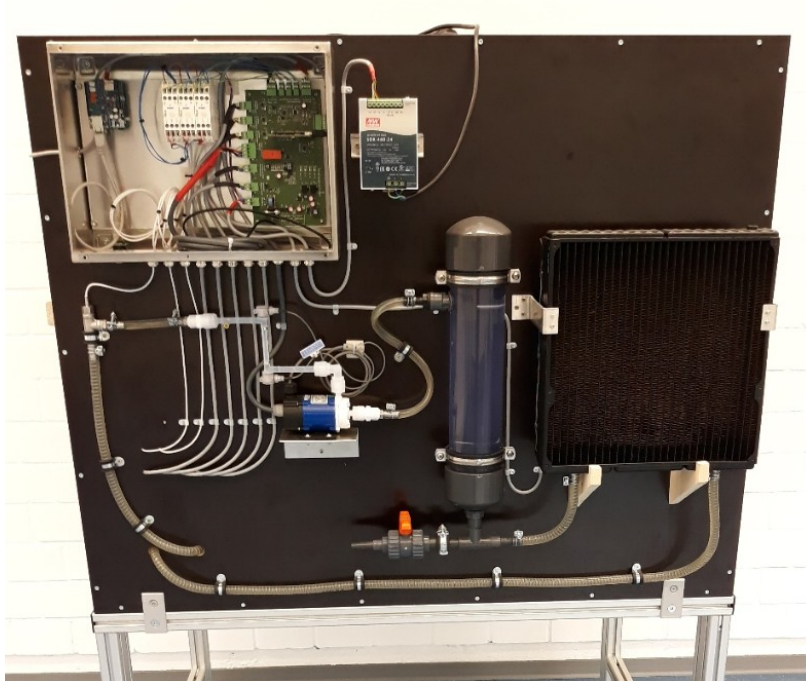
Intro: Calorimetric Test Chamber





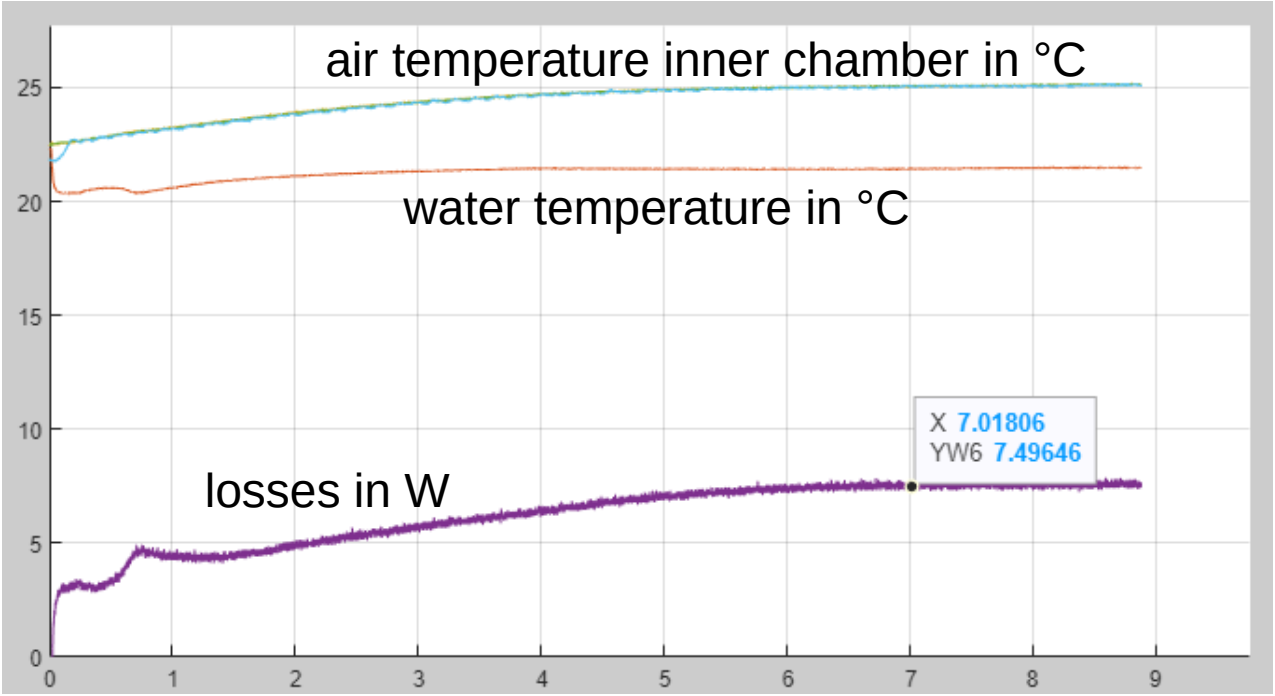
Intro: Calorimetric Test Chamber





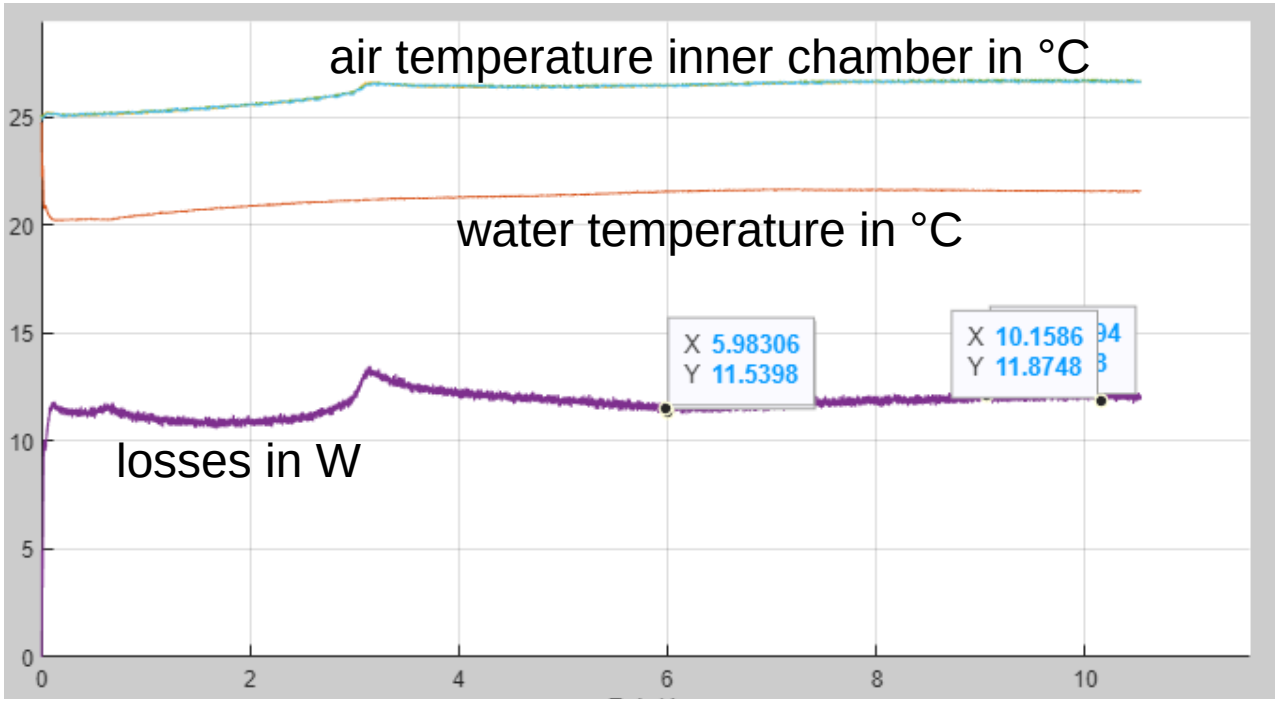
Problems

- **Long system settling time (> 5h)**
  - **Water temperature is key problem**



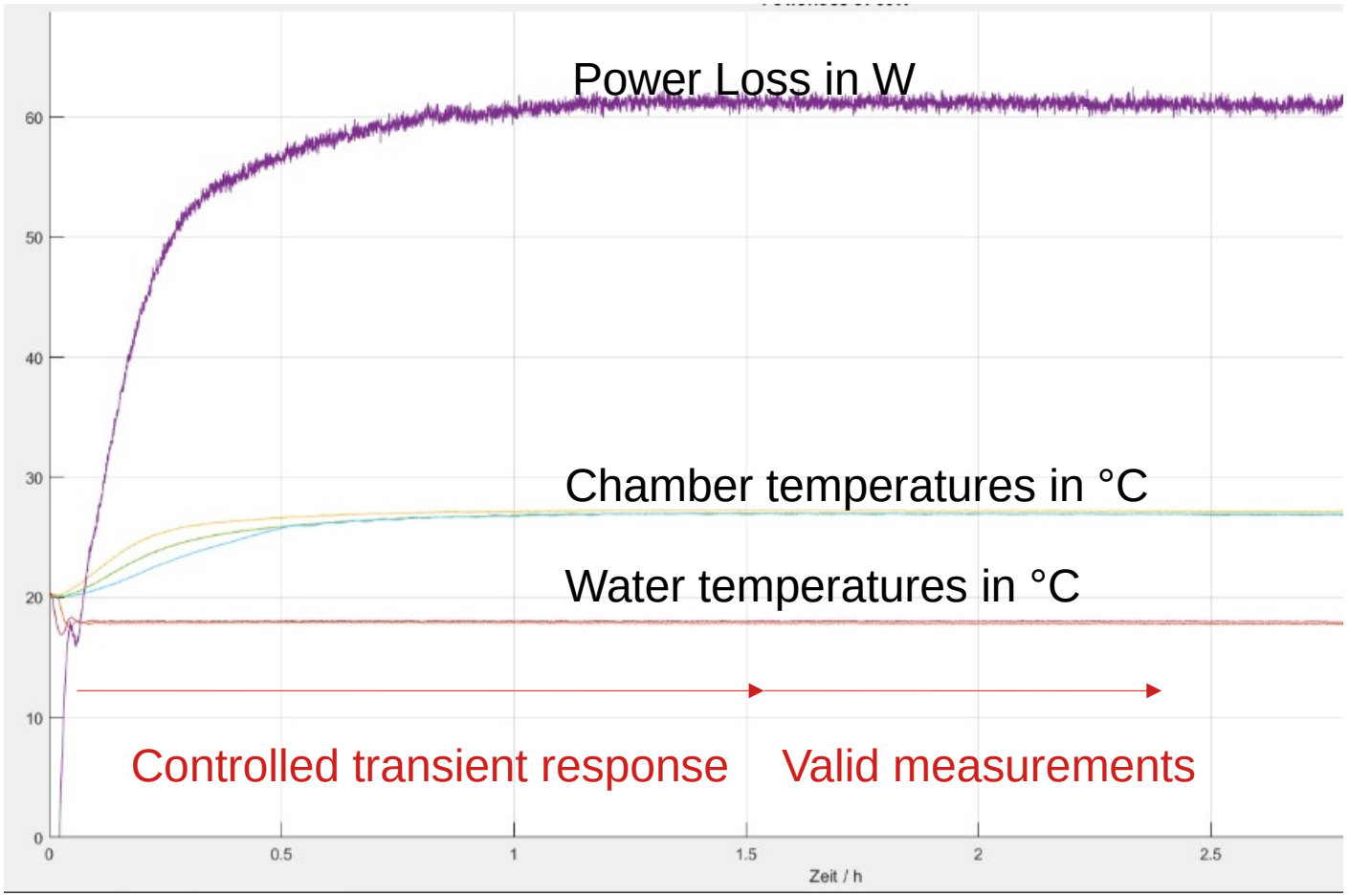
Problems

- **Vulnerable to disturbances**
  - **Open window in laboratory**



Introducing a control for chamber temperature and cooling water temperature

- **Measurement time < 2 hours**



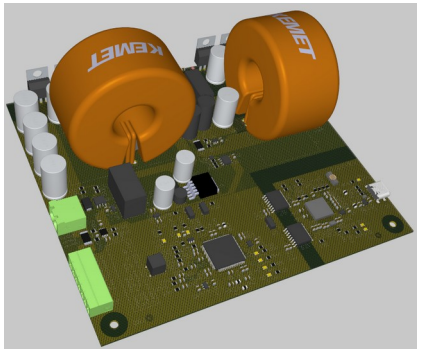
Project task: Practical implementation

PART I

- System Analysis
  - Identifying control variables
  - Simulation in Matlab/Python
- Prototype control for single operating points

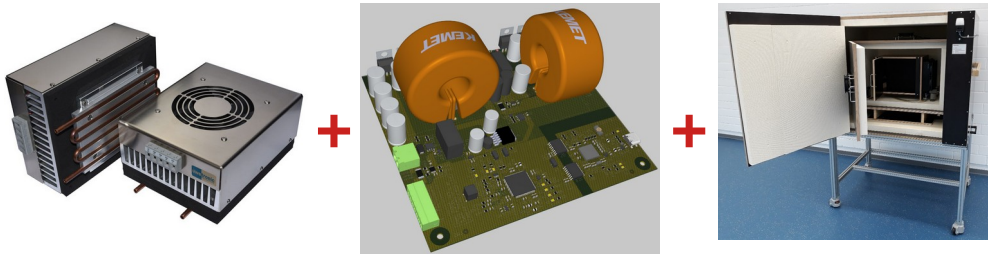
PART II

- Practical implementation
  - Active pre-heating/-cooling for multiple operating points
  - Schematic and PCB Design



PART III

- Practical implementation
  - Integration in the existing project
  - Control loop dimensioning
  - Microcontroller programming
- Validation of loss measurements for multiple operating points



Project task: Practical implementation

PART I

- System Analy
  - Ident ntrol variables
  - S in Matlab/Python
- Pro ntrol for single operating points

DONE

PART II

- Practical imple n
  - Activ ding/-cooling for multiple op oints
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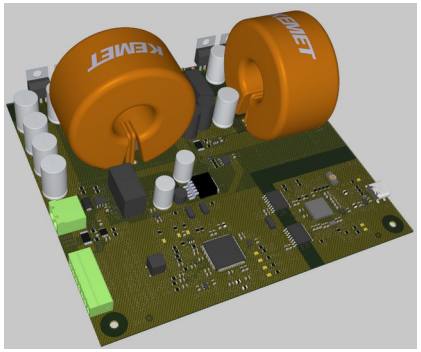
DONE



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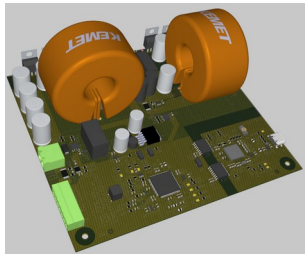

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Project Task: Skills

Skills (you can learn/improve)

- Calorimetric measurement
- Power electronics
- Control loop programming
- C and Matlab programming
- PCB design
- Version-control-system (Git)
- Lab work

This Project

Deadlines/Organisation

- Make appointment for mandatory interview via mail to **piepenbrock@lea.upb.de** until **Tuesday 11th, 8am**

- Interviews take place on **Wednesday April 12th**

- If you have time limits for April 12th, please include that in the email. We will try to take it into account.

- Possible topics in interview:
  - Power electronics
  - Thermal management
  - Programming
  - Control (P/PI/PID-Controller)
  - ……

Power Electronics and Electrical Drives
Paderborn University
D-33098 Paderborn, Germany
Web: lea.upb.de

General Information

GENERAL INFORMATION

- Self managed group work
- You are responsible for your results
- 9 credits (= 270 h workload)
- Time range ≈ 6 month with 10 h per week
- Meetings are held every week
- Not every applicant can be admitted to the project, since the number of participants is limited