



University of Stuttgart

Institute of Combustion and Power Plant Technology

Prof. Dr. techn. G. Scheffknecht

SRP and Master´s Thesis in the topic of low-cost sensors

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Motivation



Low-cost sensors (LCS): a game changer in monitoring air pollution?

- LCS are small measuring units that can detect a target gas or particulate matter.

Sensors for gases:

- Electrochemical  50 €
- Metal oxide  16 €

Sensors for particulate matter (PM):

- Optical Particle Counter  350 €
- Nephelometer  30 €

End products:



Differences between traditional monitors and the LCS

Standard, High-End devices

Low-cost sensors

Expensive

Cheap

Large, heavy

Small, light, portable

High accuracy

Noisy

Stable

Meteorological interferences

Long operating life

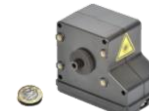
Short operating life



Standard gravimetric instrument for PM measurements



Chemiluminescence device for NO_x measurements



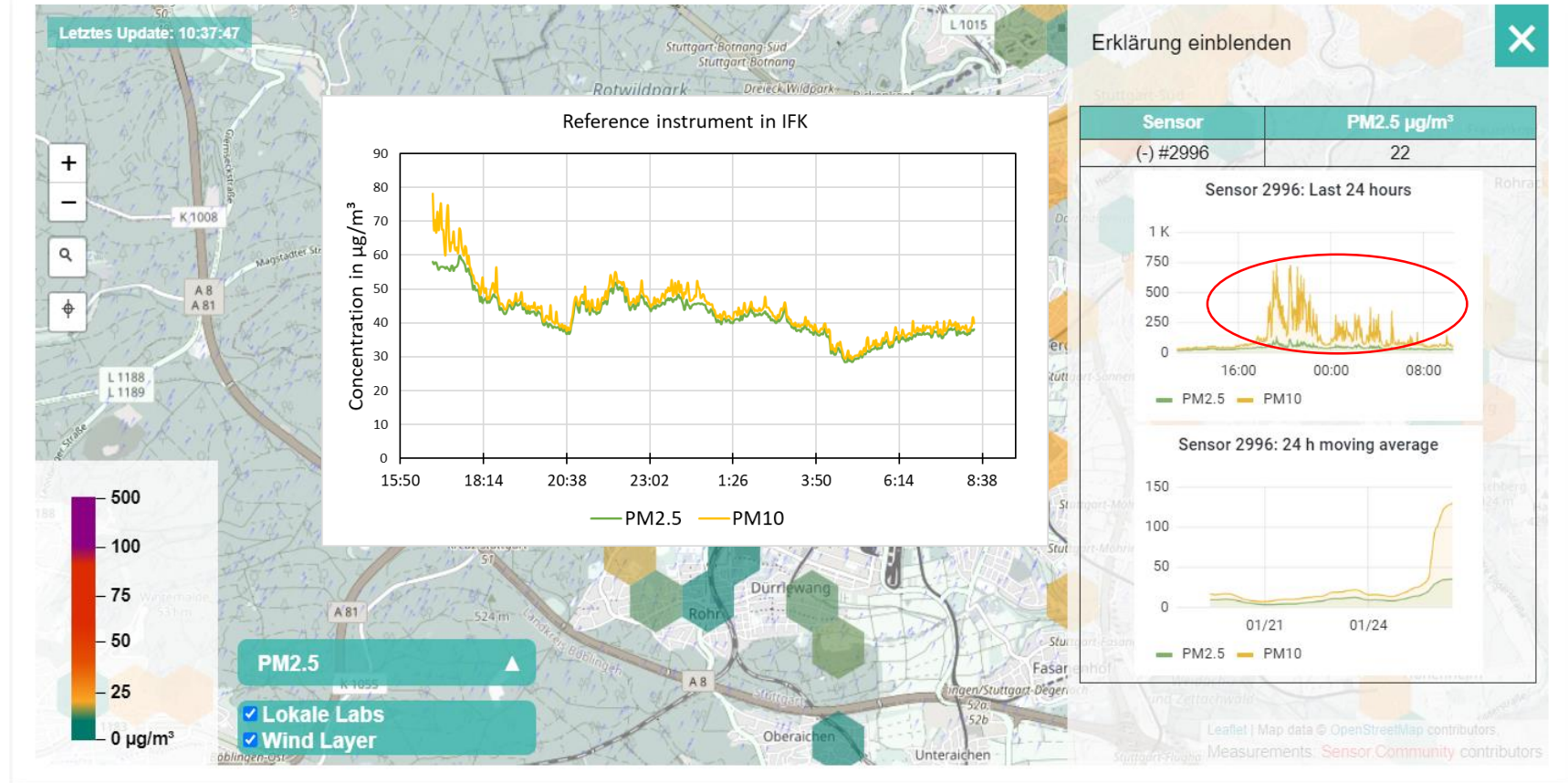
Low-cost Optical Particle Counter (OPC)



Electrochemical sensor for NO₂

The problem of the high relative humidity in sensors for particulate matter:

Sensor network in Stuttgart: <https://sensor.community/en/>



Possible SRP or Master ´s Thesis in the topic of low-cost sensors

- Title: **Evaluation of sensors for particle matter**
- **Aim of the work:** to perform an evaluation of 3 particle matter sensors from the company Tera Sensor. The focus will be in the performance under high relative humidity.
- **Method:**
 - Set up the sensors with a microcontroller in a waterproof box
 - Test in laboratory conditions with test aerosols and controlled RH
 - Field measurements including high relative humidity
 - Data evaluation and presentation
- **Requirements:**
 - Work independently, reliable and structured.
 - Willing to learn about coding and electronics
 - Interest in air quality
 - Report in English or German



Start: May/June or under agreement with supervisor

Possible SRP or Master ´s Thesis in the topic of low-cost sensors

- Title: **Design and evaluation of a thermal dryer for particulate matter sensors**
- **Aim of the work:** investigate the temperature profile of a low-cost thermal dryer and the construction and test of a new prototype based on the previous research already done

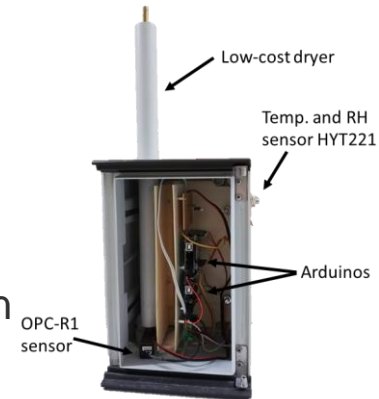
- **Method:**

- Literature review of previous work
- Temperature tests of the current dryer and CFD simulations
- Design and construction of a new prototype
- Test the new prototype
- Report writing and presentation



- **Requirements:**

- Work independently, reliable and structured.
- You like working with electronics and microcontrollers
- Basic knowledge in CFD and heat transfer
- You like building things
- Report in English or German



Start: May/June or under agreement with supervisor

Possible SRP or Master 's Thesis in the topic of low-cost sensors

Are you interested in low-cost sensors but none of the proposals fulfill your wishes?
Contact me and we may be able to find a topic that fits what you are looking for.



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Thank you!



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