HelmholtzZentrum münchen
German Research Center for Environmental Health

GRIMM AEROSOL TECHNIK

SmartAQnet

Use of new measurement device to build a high-resolution network in Augsburg city – Smart Air Quality Network-Project

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INTRODUCTION

In traditional approach, the air quality in urban environment is monitored by relatively few measuring stations using stationary measuring technology. However, the spatial distribution of air pollutants in cities is very inhomogeneous and depends on various factors. The **Smart Air Quality Network** project (SAQN) is aimed to set up a dense network of sensor devices for particle mass and number concentration in the city of Augsburg (Germany) as well as conducting of intensive mobile measurements including walking and bike measurements. The main target is to generate real-time data that can be used for several actions and measures in order to reduce pollution levels as well as to inform people about the current levels of air pollutants. Furthermore, the data will be also used for the development and validation of dispersion and land use regression models. SAQN is a pragmatic and data driven attempt in which all available data will be combined to an integrated, reproducible, finely-tuned (spatial, temporal) and cost-effective air quality measuring network measurement network.

PROJECT PARTNERS

- Aerosol Akademie e.V.
- Grimm Aerosoltechnik GmbH & Co. KG
- Helmholtz Zentrum München (Insitut für Epidemiologie, CMA)
- Karlsruher Institut für Technologie (KIT) (TECO, IMK-IVU)
- Universität Augsburg
- City of Augsburg
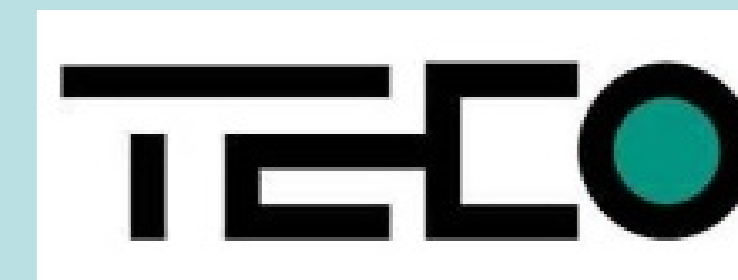
AIMS

- to set up a dense network of sensor devices in model region Augsburg (scientific scouts and low cost sensors)
- to conduct intensive mobile measurements by walking and biking measurements as well as demand-oriented measurements by light-weight Unmanned Aerial Vehicles
- to develop and validate different dispersion (GRAMM/GRAL) as well as land use regression models
- to measure and predict personal exposure to fine and ultrafine particles
- to establish a big data storage system, which allows to import data easily, to analyze the data and made it available for different applications: science, public authorities and citizens.
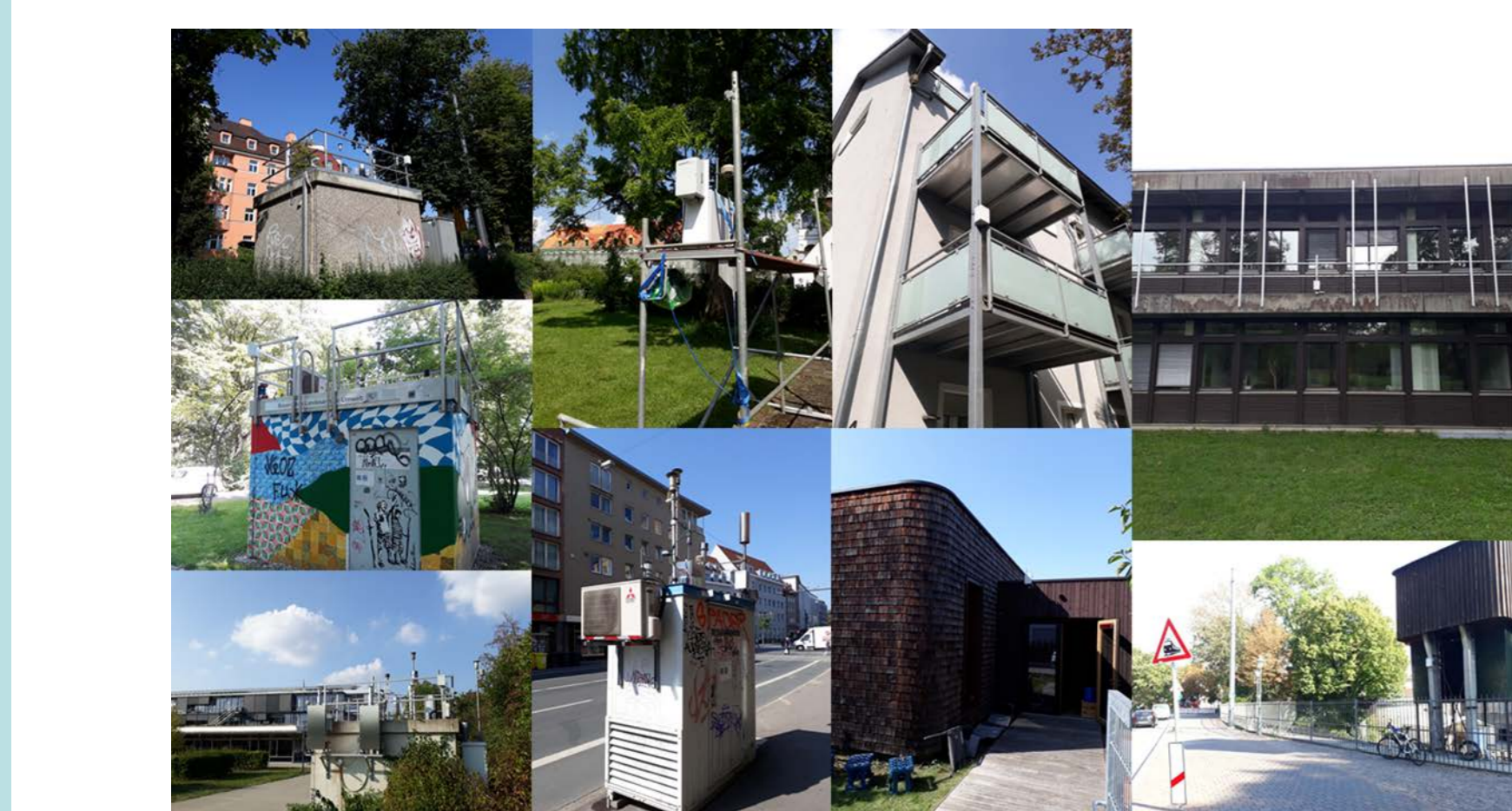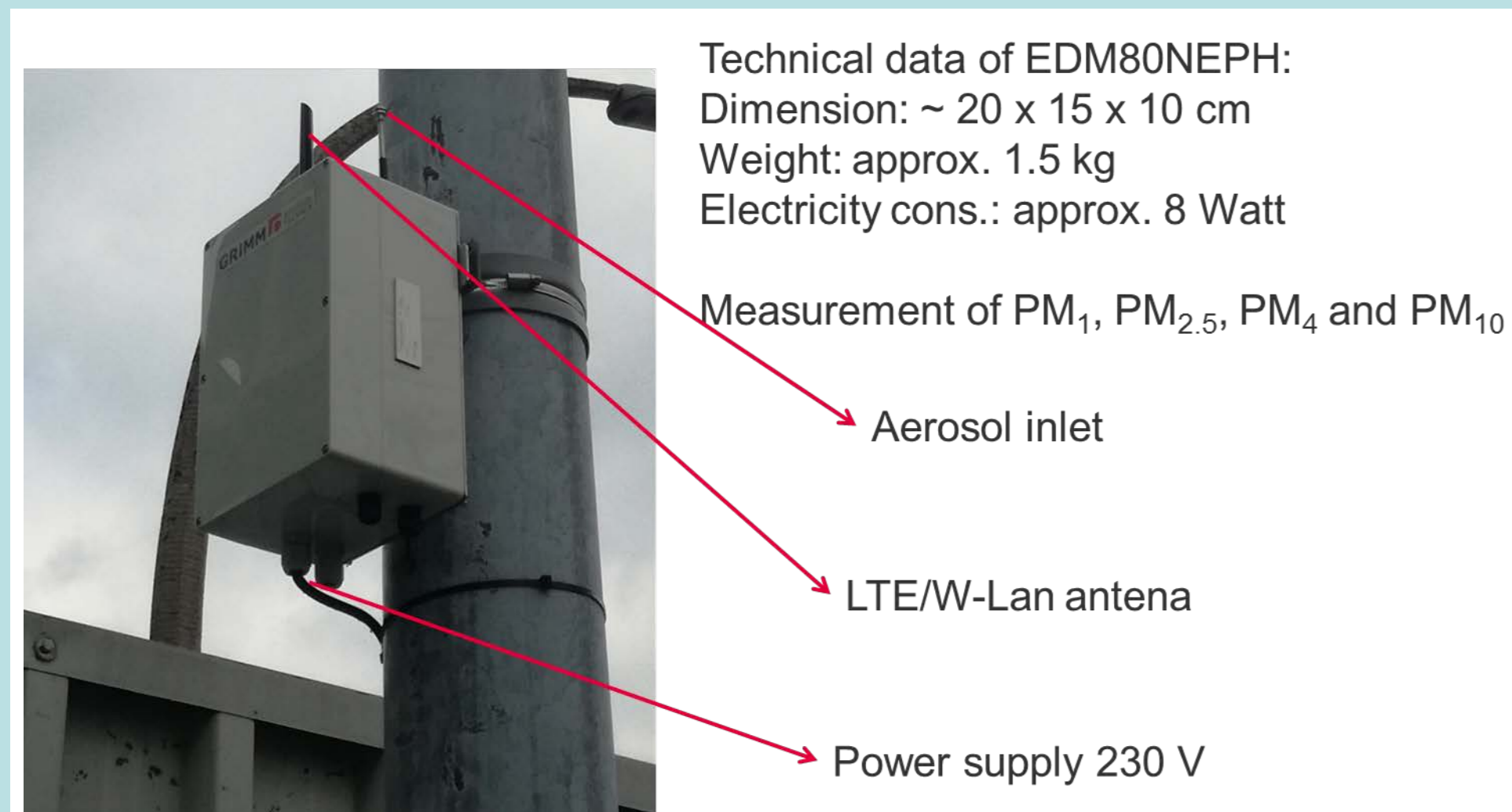
DATA STRUCTURE

A wide range of measurements with instruments of various price and quality will be integrated:

- Very precise measurement devices at fixed monitoring sites (yellow level).
- Novel autonomous and auto-calibrated smart devices, so called "**Scientific Scouts**" with a medium level of precision (red level)
- Low-cost measurement sensors (low precision but high number of sensors – green level).
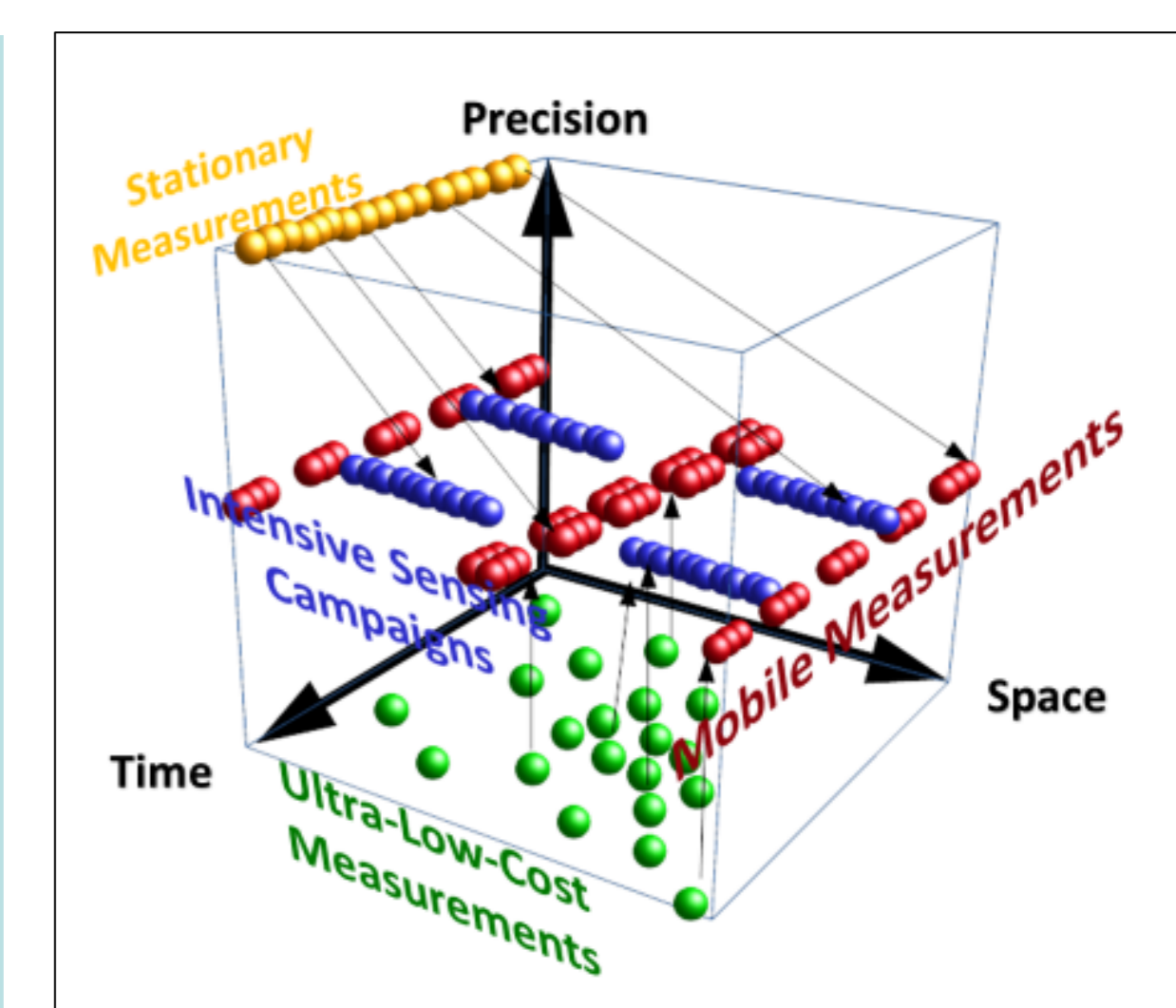
PRELIMINARY RESULTS (installation and calibration of the Scientific Scouts (Phase 1)

In Phase 1 we already installed 15 **Scientific Scouts** developed by GRIMM Aerosol company at different sampling sites within the City of Augsburg. The sampling sites are located in different environments: close to traffic and traffic hotspots, near combustion sources, in the city center and in urban background.

Technical data of EDM80NEPH:
Dimension: ~ 20 x 15 x 10 cm
Weight: approx. 1.5 kg
Electricity cons.: approx. 8 Watt

Measurement of PM_1, $PM_{2.5}$, PM_4 and PM_{10}

→ Aerosol inlet

→ LTE/W-Lan antena

→ Power supply 230 V

Calibration of the Scientific Scouts by comparison with a reference measurement device (Grimm EDM164):

Calibration scheme
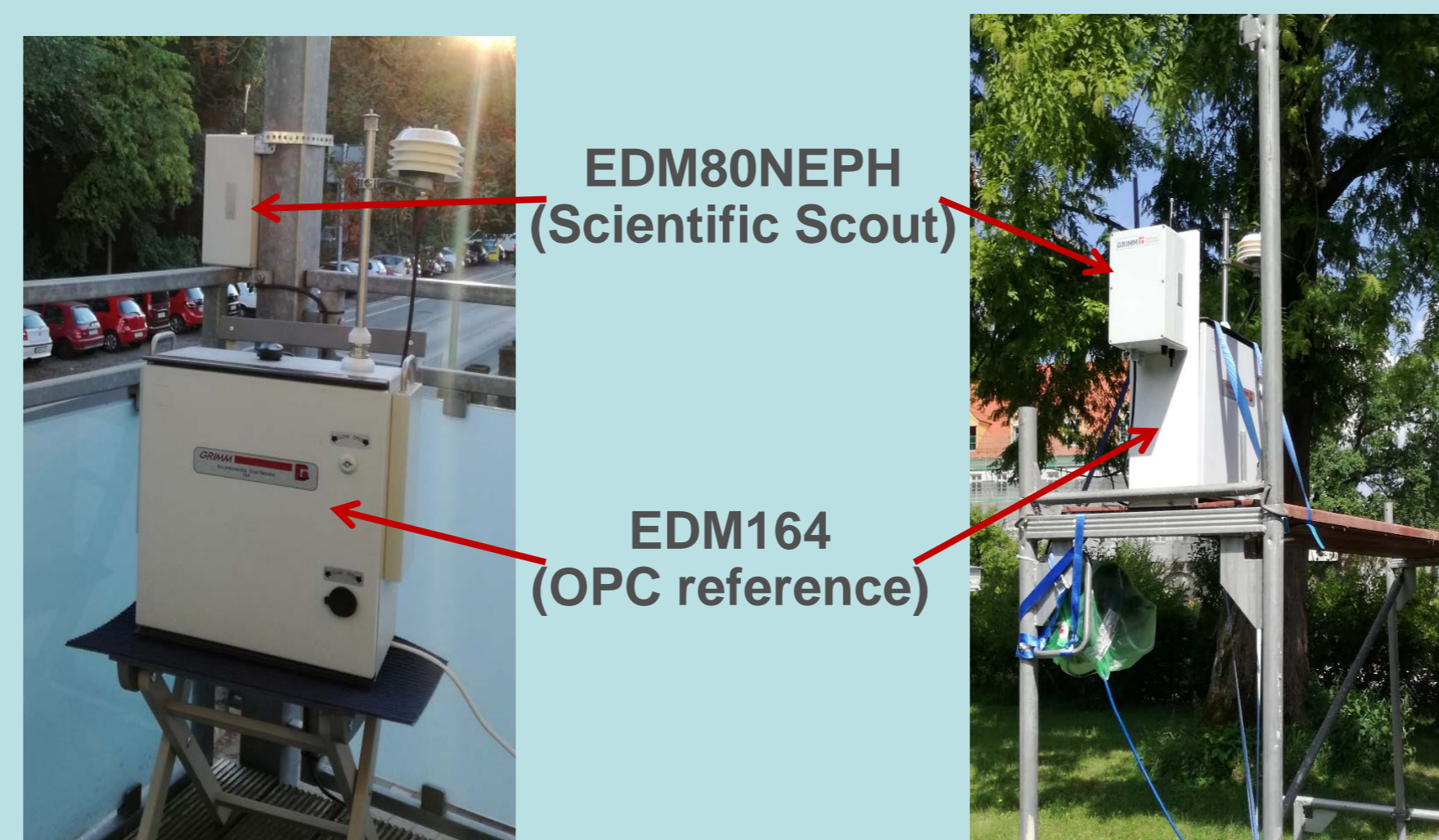
Comparison of three Scientific Scouts with a reference device

EDM80NEPH
(Scientific Scout)

EDM164
(OPC reference)
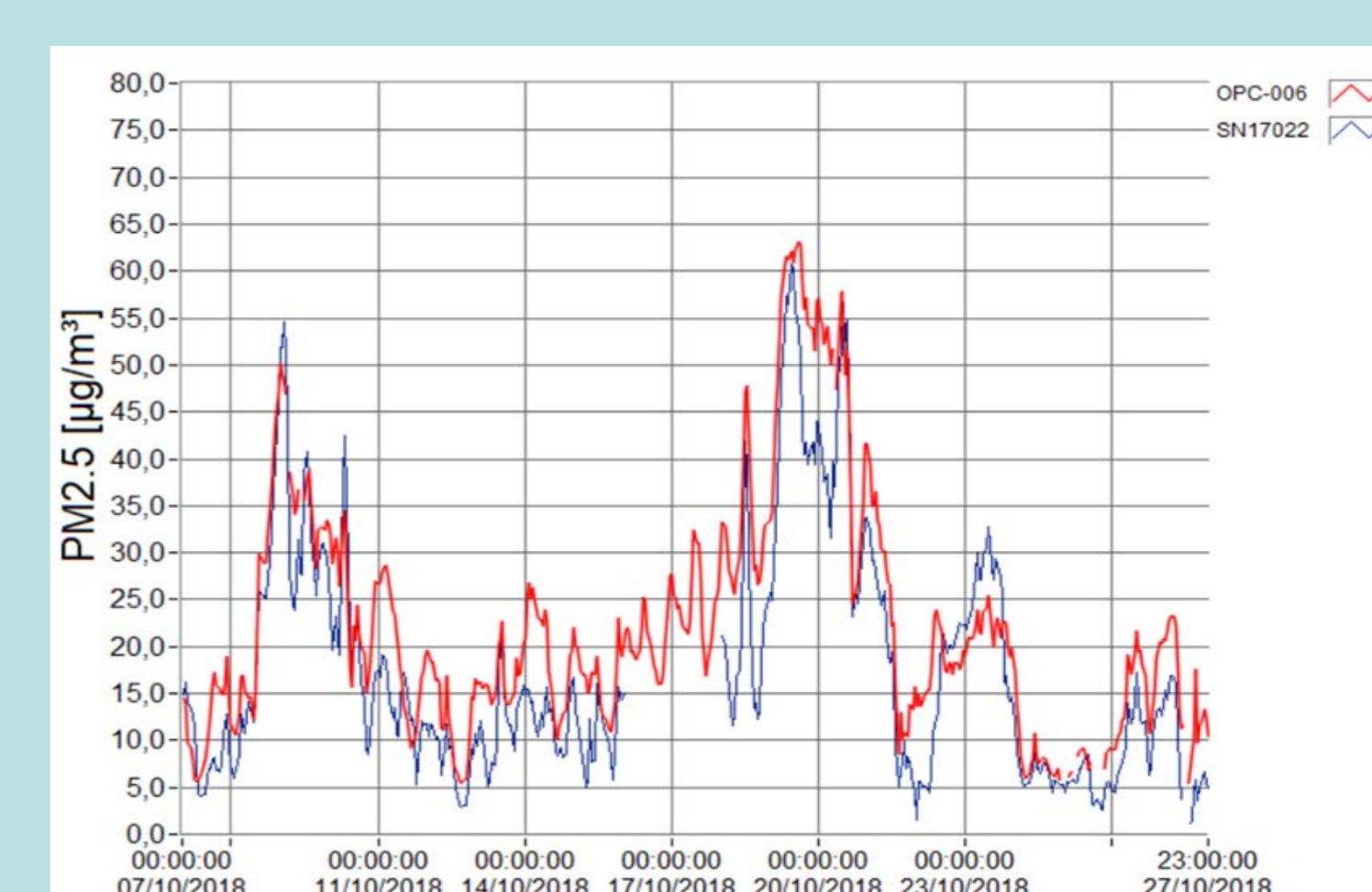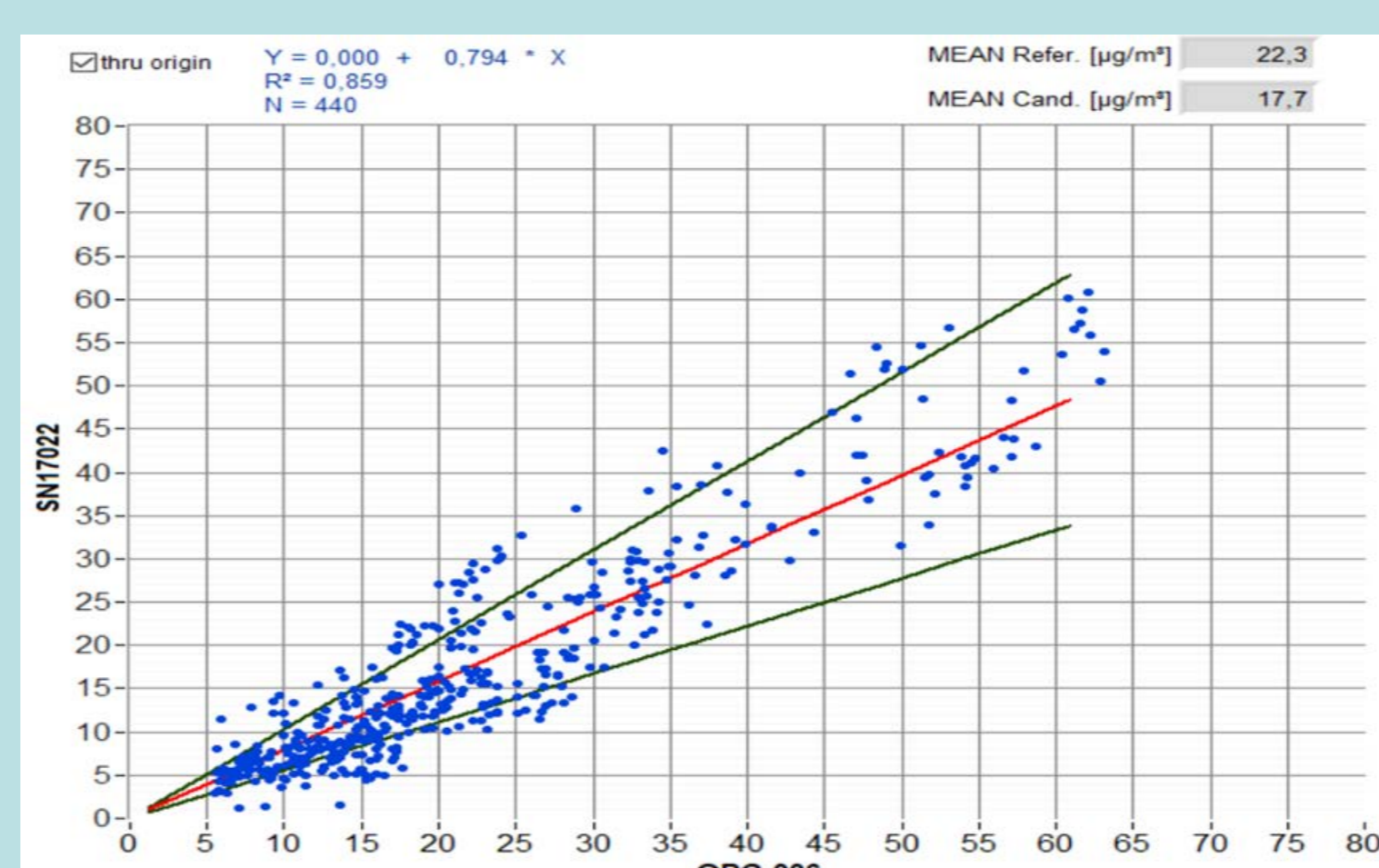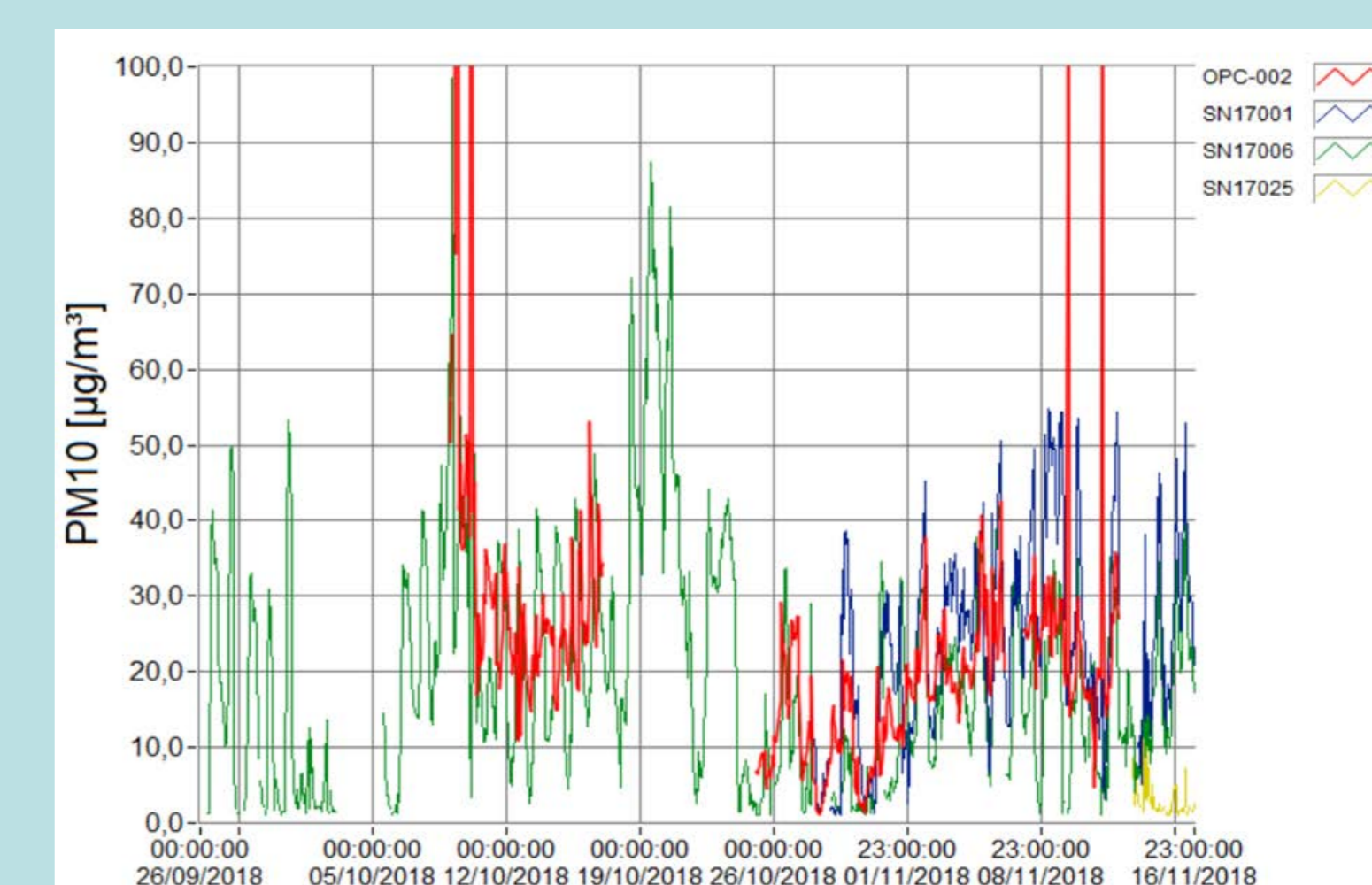
CONCLUSIONS AND FUTURE STEPS

The preliminary results suggest that the performance of the Scientific Scouts is sufficient for the purpose of SAQN project. They are showing a good performance and measure particle mass at a medium level of precision. Ongoing calibration will help to improve the performance and efficiency of the Scientific Scouts. In Phase II of this project 35 updated Scientific Scouts for measurement of particle mass and number concentrations will be installed until summer 2019. The planned extension of the network will provide necessary data for the modelling approach and the mobile measurement campaign. The planning of the mobile and personal measurements is ongoing.