***Site audit report Melpitz, Germany***

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**Summary**:

Measurements of physical aerosol properties at the EUSAAR site in Melpitz have been audited by Dr. Paolo Villani, December first 2009.

The research station of the IfT is situated near the village Melpitz in the vicinity of the city Torgau in the river Elbe valley (87 m above sea level, 51°32' N and 12°54 ' E, Fig. 1).

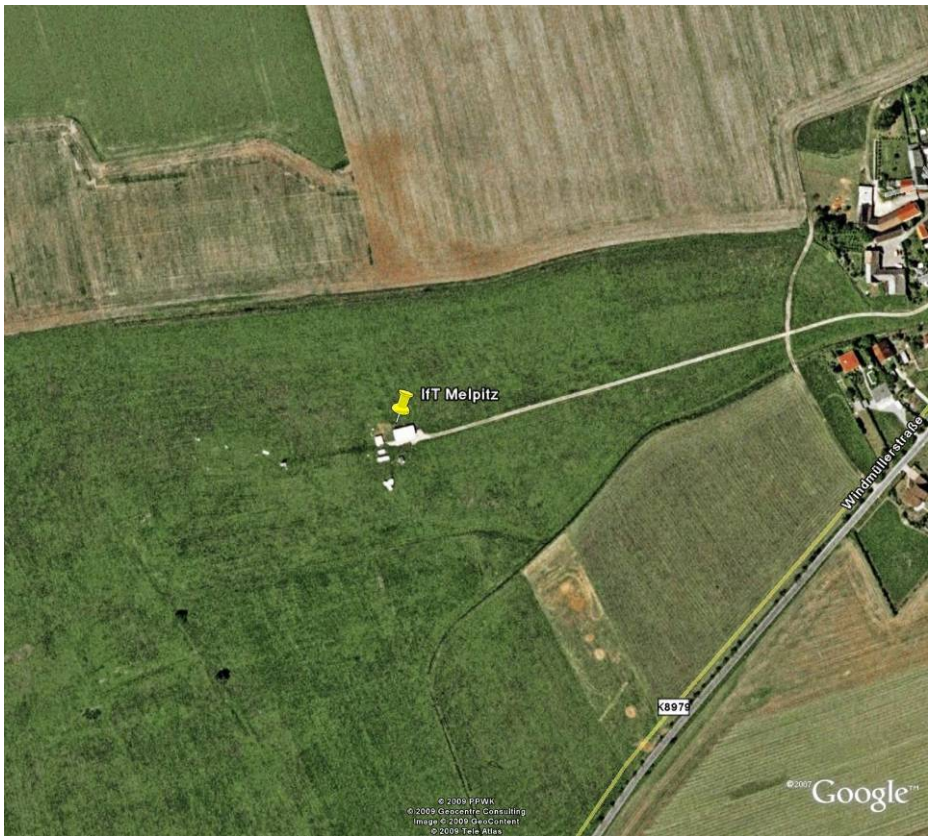

Figure 1: Google Earth view of the area near the Ift-research station.

The station is located on a flat meadow surrounded by agricultural land. The distance to Leipzig in the southwest is 41 km. A federal main road (B 87) crosses the region in a minimum distance of 1.5 km in northern direction. The available aerosol instruments for continuous monitoring activities at the Melpitz site are: Twin-DMPS with switching thermo-desorber (fixed at 300 degrees Celsius), Nephelometer, MAAP and UV-APS. All instruments are properly installed inside in a temperature-controlled container (around 22 degrees Celsius) sucking from a common stainless steel sampling PM10 inlet (Thermo Andersen, 1 $m^3/h$) mounted about 3 m above the roof (Fig.2).

Figure 2: Outside view of the measurements station

Beside to the container a metal cabinet contains the air compressor and the vacuum oil free pump system: in some cases it could represent a potential source of particles.

**Documentation and data availability**: All the instrument manuals are available at the site. Instrument performance and maintenance is recorded in an English electronic logbook. There is no stand-alone website for the Melpitz site but online data can be accessed via by the IfT website www.tropos.de. **Data are submitted to the EMEP database on time.**

Documentation at Melpitz complies with EUSAAR requirements.

**Inlet**:

The common inlet is currently and continuously humidity conditioned (Tuch et al., 2009: Design and performance of an automatic regenerating adsorption aerosol dryer for continuous operation at monitoring sites) to keep sample flow RH underneath 30%. Instruments draw their sample from a stainless steel flow splitter (Fig.3) inside the container.

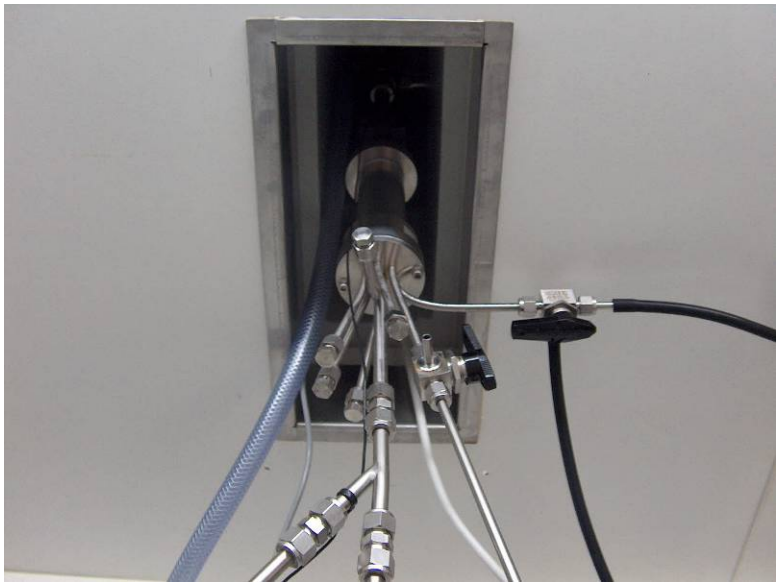

Figure 3: View of the flow splitter

Efforts in order to reduce the number of tubing bends and flow restrictions are made. No leak is found after placing a total filter on the top of the common inlet: all instruments measured “zero” after a few minutes. Aerosol inlet at Melpitz comply with EUSAAR standards.

**Twin-DMPS:**

The T-DMPS system is a combination of two Hauke-type DMAs and two Condensation Particle Counters (TSI model 3025 and 3010). The system is set up in a 19” rack (Fig. 4) and is equipped with a switching thermo-desorber to estimate the non-volatile fraction of the aerosol at 300 degrees Celsius in the sub micrometer range.

Figure 4: TDMPS system in Melpitz

Even if this device is not required from EUSAAR, in order to relatively compare the residual aerosol distribution after volatilization with the reference (at ambient temperature) size distribution, we suggest using the same tube (same inner diameter) for both lines to reduce artifacts in the measure. Actually the reference line is a stainless steel 3/8” tube and the oven line is a ¾” tube leading in a different residence time (thermophoresis and diffusion losses are different).

The number size distribution is measured in two size ranges 3-78nm and 22.5-800 nm step-wise and simultaneously. The sheath air of both DMA s is dried by Silica Gel Diffusion Dryers and arranged in a blower closed loop set up: the flow rate sets in the DMAs are 5 lpm (for the long one) and 20 lpm (for the short one). Calibrated capillary and high sensitive differential pressure transducers allow the measure of sheath and aerosol sample airflows of both DMAs.

Both recorded sheath and sample aerosol airflow rates were in good agreement with those measured with the reference Gilibrator (less than 2%).

The Latex test aerosol with a nominal particle diameter of 200 nm was sized correctly as shown in Fig.5

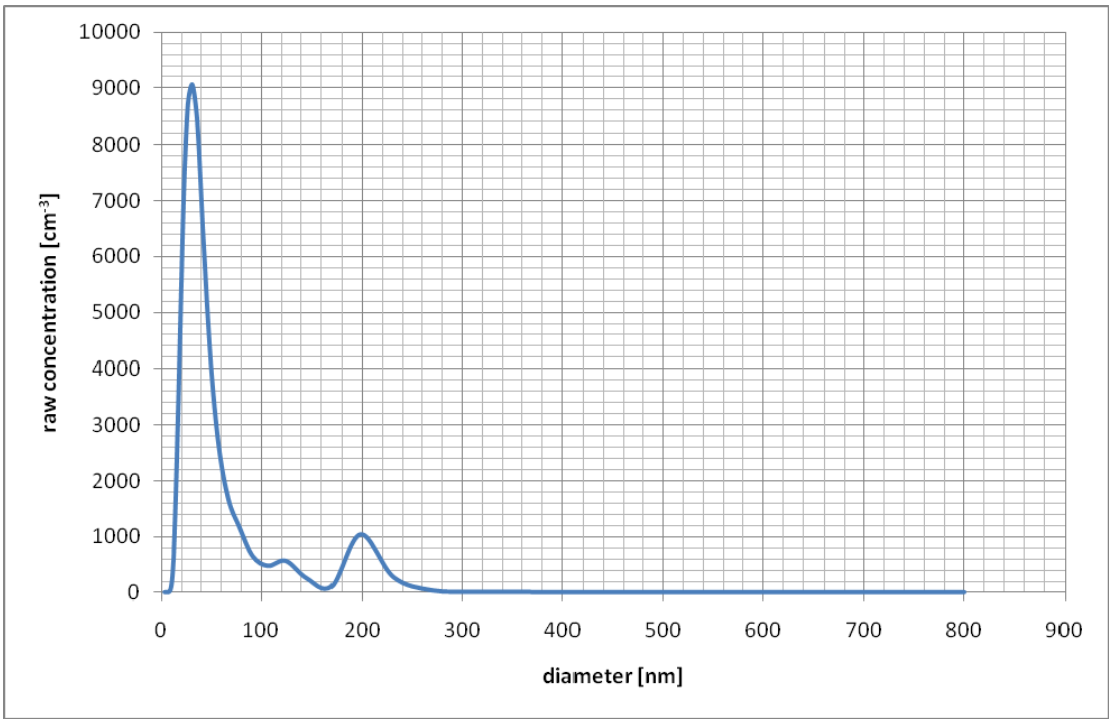


Figure 5: Sizing test with 200 nm Latex particles.

The TDMPS at Melpitz operates properly.

**Nephelometer**:

A three wavelength integrating TSI Nephelometer 3563 is used to detect the scattering properties of aerosol particles (Fig. 6).

Figure 6: TSI Nephelometer in Melpitz

The instrument has participated in the previous inter-comparison workshop at the WCCAP and calibrations constants (K2 and K4) are stored in a calibration file allowing a fast reply of the instrument state after each calibration. However the instrument was calibrated during the audit showing good results regarding the previous calibration.

The Nephelometer at Melpitz operates according to EUSAAR specifications.

**MAAP**:

A Multi Angle Absorption Photometer is used to measure absorption of aerosol particles at Melpitz. The indicated aerosol flow of 9 lpm was in good agreement with the reference Gilibrator. No leaks were found during the “Zero filter test”.

The MAAP at Melpitz field station operates according to EUSAAR specifications.

**UV-APS**:

A TSI UV-APS (Figure 7) is used to measure the number size distribution of particles larger than 700 nm.

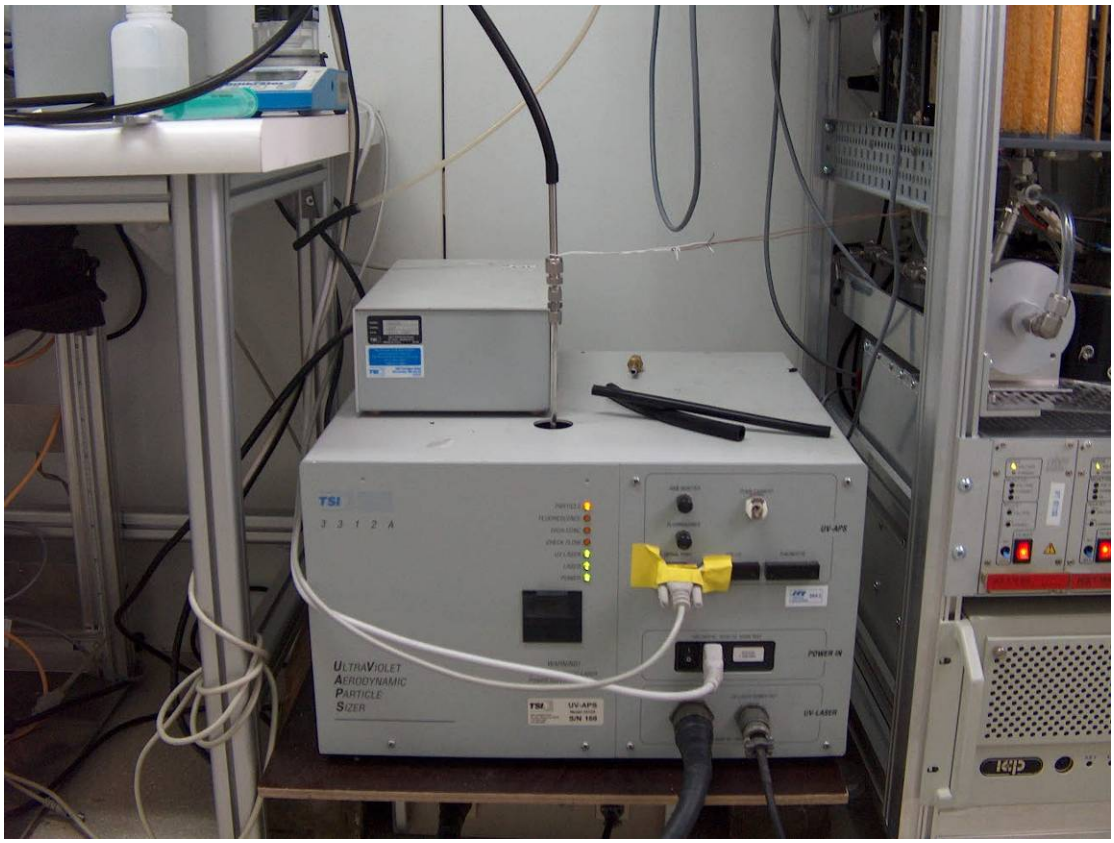


Figure 7: UV-APS in Melpitz

Flow rate of the instrument was checked with reference Gilibrator during the audit, showing good agreement. The instrument inlet is almost

vertical and correctly sized, however we suggest to replace the “plastic/metal mixed inlet fitting“ with a more stable and rigid one.

The APS at Melpitz it seems to measure properly (regarding the last channels measured by the TDMPS between 500-800 nm both spectra are overlapped and similar).

**Conclusion**:

The overall set up of the field station in Melpitz complies with all EUSAAR requirements. However, some suggestions are given in order not to only say: “Perfect”.