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8th METAS Calibration Workshop for particle analyzers on August 26 to 28, 2009

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13th ETH-Conference on Combustion Generated Nanoparticles, June 22nd to 24th 2009

Motivation and objectives

The METAS calibration workshop is a periodic opportunity for the exchange of knowledge for users of combustion particle measuring instruments. During a calibration procedure with their own measuring instruments discussions between the participants about measuring principles, instruments and experience will take place.

The particle measuring systems will be calibrated with real combustion aerosols in a controlled environment. Since the instruments are used at individual settings, the determined deviation in the workshop shows the reliability of the results at the setting of each participant. The exchange of the results and the experience between the participants will permit to optimize the individual measuring procedure.

Setup of instruments

The workshop will take place in the particle laboratory of METAS. The laboratory is air conditioned; the room temperature is (21 ± 2) °C. For the installation of the measuring instrument about ½ m^2 space is provided. Each space is equipped with a power supply, particle-free and dry compressed air as well as nitrogen (Quality 50).

The source for the aerosol is the CAST (combustion aerosol Standard, www.sootgenerator.com). The aerosol flow from the source is multi-stage diluted, neutralized with a ^{241}Am-source, splitted and distributed pressureless, and transfered to the instruments by means of tubes with 8 mm diameter and 2 m in length (Figure 1). The instruments suck themselves the volume needed (up to 5 L/min).

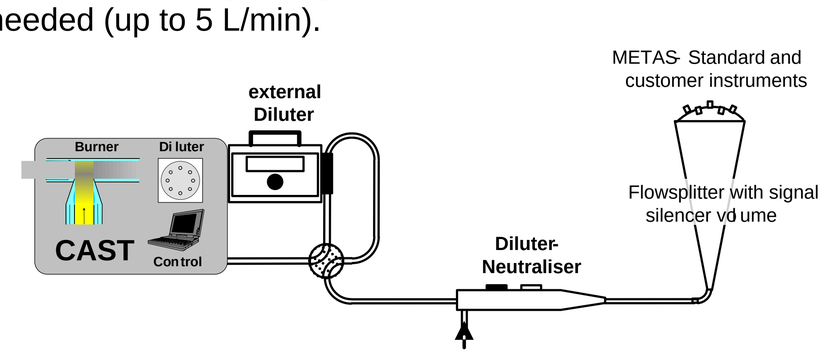

Figure 1: Scheme off instrument arragement and tubing

Registration

Further information and registration form are available on www.metas.ch/aerosol -> Combustion Particles. Every participant is responsible for his expenses and the transportation of his instrument. METAS will charge CHF 1030.- (excl. VAT) per particle analyser for infrastructure and organisation.

Schedule of workshop

- Preparations (26. 08. 2009, afternoon):
  Installation, briefing and if needed test run with combustion aerosols
- First day of operation (27. 08. 2009):
  Run with particles 180 nm; 4 concentrations
  Run with particles 80 nm; 4 concentrations
- Second day of operation (28. 08. 2009):
  Run with particles 120 nm; 4 concentrations
  Run with particles 40 nm; 4 concentrations
  Debriefing, unrigging, departure
- One month after the comparison at least:
  Transfers of data to METAS according to specified formats and layout
- Three months after the comparison at least:
  Distribution of the final report and calibration certificates

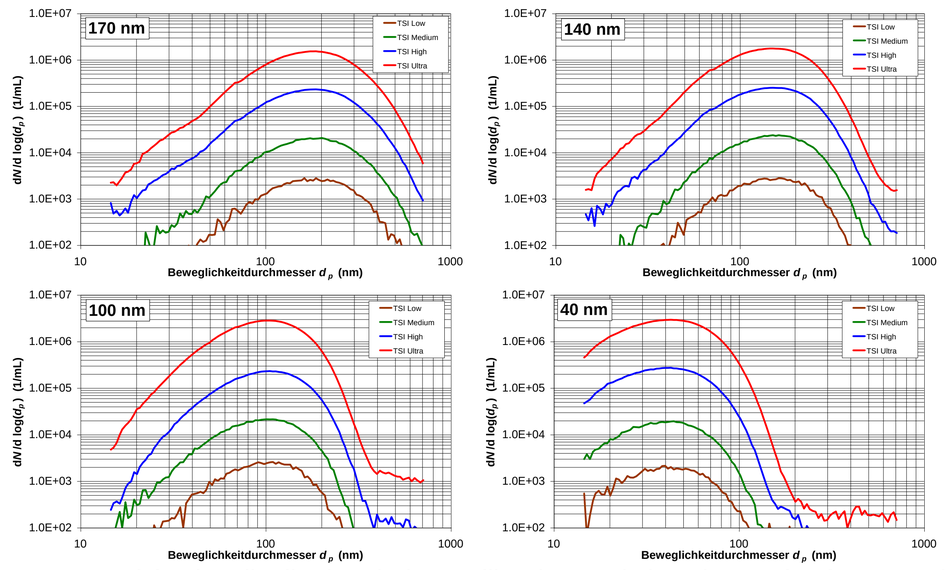

Figure 3: Particle size distribution during calibration workshop (examples from 2008)

Results presentation

The results of the measurements during the workshop are summarized in a METAS report comprising tables and figures of all measurements (Figure 4) and – on request – an individual METAS calibration certificate.

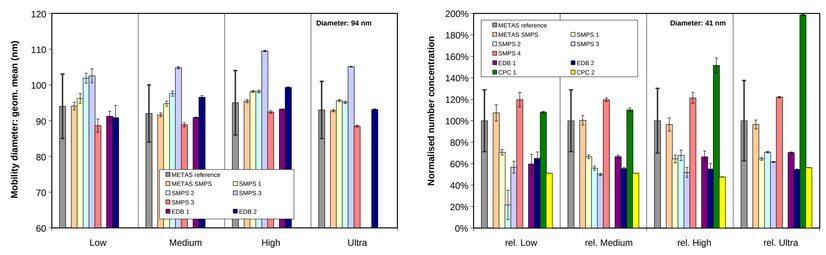

Figure 4: Examples for size measurement at 94 nm and number concentration comparison for 7 resp. 9 particle analysers at number concentrations 10^3 cm^{-3}, 10^4 cm^{-3},10^5 cm^{-3},10^6 cm^{-3}.

Procedure of measurement

The measurements are performed in four half-day sections (refer to figure 2). The aerosol is kept constant during a time period of 30 minutes (measuring point). For each measuring point the averaged key parameter shall be evaluated. Every participant should operate his instrument according to his own quality manual. Every participant will evaluate his ensemble of results (verified data) and transmit to METAS for the final report:

- Average particle sizes d_g (geometric mean of the size distribution)
- Geometric standard deviation (GSD) σ_g (width of the size distributions with a logarithmic size axes)
- Particle number concentration of particle c [cm^{-3}] (integral of the size distributions)
- Standard deviations and number of measured values (for d_g, σ_g, c)

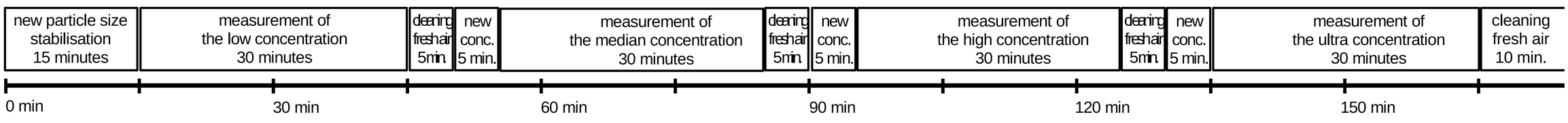

Figure 2: Measuring procedure for one particle size and four number concentrations