AirMonTech: Outline of Work Package 1

Recent technologies for air pollution monitoring

Christoph Hueglin, Annette Borowiak

iuta

CSIC
Consejo Superior de Investigaciones Científicas

ECN

EMPA

ies
Institute for Environment and Sustainability

JRC
European Commission

NILU

National and Kapodistrian
University of Athens

NPL
National Physical Laboratory

Universität
Duisburg
Essen

Seventh Framework Programme

AirMonTech
Air Pollution Monitoring Technologies for Urban Areas

Objectives of WP1

a. compile information on performance of available instruments for measurement of air pollutants (regulated in Air Quality Directive 2008/50/EC)

b. provide guidance for optimal use of this available instruments (measurement technologies)

c. provide easy access to this information through databases (created within WP3)

$\Rightarrow$ harmonisation of air quality measurements in Europe

WP1 – Air pollutants

✓ SO_2	EN 14212 (2005)	
✓ NO_2 and NO_x	EN 14211 (2005)	
✓ O_3	EN 14925 (2005)	
✓ CO	EN 14626 (2005)	
✓ PM10	EN 12341 (1998)	manual reference method
✓ PM2.5	EN 14907 (2005)	manual reference method
✓ Benzene	EN 14662 (2005)	

– Pb, Cd, As, Ni	EN 14902 (2005)	manual reference method
– EC, OC		no reference method
– Inorganic ions in PM		no reference method
– PAH	EN 15549 (2008)	BaP only, manual method

WP 1 – approach

- Collection of relevant documents …

    1. Type approval test reports
    2. Standard operating procedures (SOPs)
    3. Equivalence test reports (mainly PM10/PM2.5)

… and making them easily accessible (databases provided by WP3)

- Evaluation: guidance document on the choice, operation and calibration of currently available air quality monitors; assessment of opportunities and limitations of available instruments

Type approval tests

- Type approval of an analyser should provide evidence that the required data quality laid out in EU directives can be satisfied
- Type approval tests are based on the evaluation of performance characteristics determined under a prescribed series of tests (lab and field) and include the calculation of expanded measurement uncertainties
- Performance characteristics and required performance criteria are listed in EN standards

Type approval tests

- e.g. EN14221 for NO_2 and NO

Table 1 — Relevant performance characteristics and criteria

No.	Performance characteristic	Symbol	Section	Lab. test		Field test		Performance criterion for NO and/or NO_2
				NO	NO_2	NO	NO_2	
1	Repeatability standard deviation at zero	$s_{r,z}$	8.4.5	x				≤ 1,0 nmol/mol
2	Repeatability standard deviation at concentration c_t	$s_{r,ct}$	8.4.5	x				≤ 3,0 nmol/mol
3	Lack of fit (residual from the linear regression function)		8.4.6					
3a	Largest residual from the linear regression function at concentrations higher than zero	r_{max}		x				≤ 4,0 % of the measured value
3b	Residual at zero	r_z		x				≤ 5,0 nmol/mol
4	Sensitivity coefficient of sample gas pressure	b_{gp}	8.4.7	x				≤ 8,0 nmol/mol/kPa
5	Sensitivity coefficient of sample gas temperature	b_{gt}	8.4.8	x				≤ 3, 0 nmol/mol/°C
6	Sensitivity coefficient of surrounding temperature	b_{st}	8.4.9	x				≤ 3, 0 nmol/mol/°C
7	Sensitivity coefficient of electrical voltage	b_V	8.4.10	x				≤ 0,30 nmol/mol/V
8	Interferents at zero and at concentration c_t [a]		8.4.11					
8a	H_2O with concentration 19 mmol/mol [b]	$X_{H2O,z,ct}$		x				≤ 5,0 nmol/mol
8b	CO_2 with concentration 500 µmol/mol	$X_{CO2,z,ct}$		x				≤ 5,0 nmol/mol
8c	O_3 with concentration 200 nmol/mol	$X_{O3,z,ct}$		x				≤ 2,0 nmol/mol
8d	NH_3 with concentration 200 nmol/mol	$X_{NH3,z,ct}$			x [c]			≤ 5,0 nmol/mol
9	Averaging effect	E_{av}	8.4.12	x	x			≤ 7,0 % of the measured value

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- Performance characteristics and required performance criteria are listed in EN standards
- Type approval tests are performed by designated bodies
- The type approval procedure should follow certification requirements laid down in European Standards EN 15267 parts 1 and 2

AirMonTech WP1 and type approval tests

- Current situation:
  - Type approval test reports are not readily available for users (e.g. network operators)
  - Difficult access to detailed performance characteristics of instruments
  - Type approval tests are mostly valid in only one Member State
- Our aim:
  - Create a comprehensive library of AMS type approval reports (including test details), thus an important source of information for practitioners (e.g. network operators)
- We need:
  - Collect detailed type approval reports from manufacturers

AirMonTech WP1 and Standard Operating Procedures (SOPs)

- SOPs are written documents/instructions detailing all steps of the air pollution measurement process (belong to the QA/QC system of a air quality network)

- All air quality networks have their own SOPs based on their knowledge and experiences with the instruments they use

- These SOPs contain a wealth of information about all technical and operational aspects of air quality measurements

- Use of different procedures as documented in the various SOPs might hamper harmonisation of air quality measurements in Europe

AirMonTech WP1 and Standard Operating Procedures (SOPs)

- Our aim:
  - Provide a comprehensive collection of SOPs for AMS as available from various European air quality networks
  - Evaluation of collected SOPs and compilation of «standard» SOPs

- We need:
  - SOPs from national and regional European air quality measurement networks

- Problem:
  - National SOPs are often in the national languages.

Demonstration of Equivalence

- Implementation of Air Quality Directives: Member States (MS) should use the reference method *or a method that it can demonstrate gives equivalent results*

- Principles and methodologies for Demonstration of Equivalence given in a report by an EC working group (http://ec.europa.eu/environment/air/pdf/equivalence_report2.pdf)

⇒ Several (many) networks have carried out equivalence tests (mainly for AMS for PM10 and PM2.5)

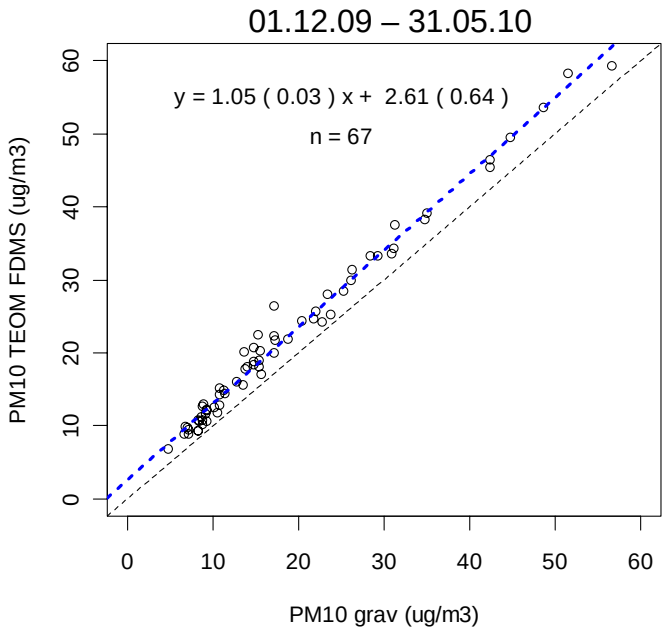
  - Collecting available test results (incl. meta data, e.g. meteo, site characteristics) and making them easily accessible is a task of WP1

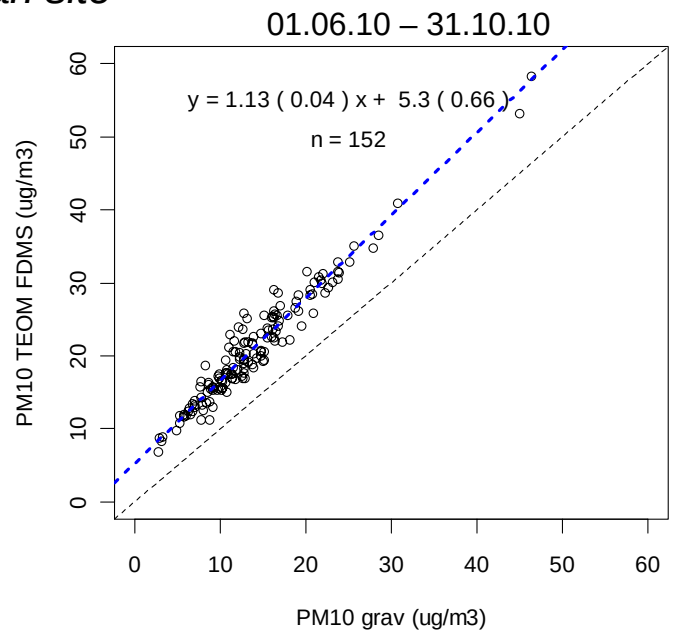
- We need:

  - Information and results from equivalence tests performed by European air quality measurement networks

PM10 – measurements with an AMS and the reference method

Basel – suburban site





AirMonTech WP 1 - summary

- Collection, evaluation and easy access (with WP3) to valuable information on available instruments for air quality measurements

- The products of WP1/WP3 (guidance document and data bases) will greatly support harmonisation of air quality measurements in Europe

- Success of WP1 relies on support from air quality networks and manufacturers (willingness to share information)