




The Role of JRC in Harmonizing Air Quality Monitoring In Europe



 

Project on 25 September 2007 - Particles and Photo-oxidants in Europe

THE ROLE OF JRC IN HARMONIZING AIR QUALITY MONITORING IN EUROPE




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HARMONIZATION OF AQ DATA IN EUROPE




A AQUILA
B Inorganic gaseous pollutant intercomparison exercises
C BTX intercomparison exercise
D VOC- ozone precursor round robin exercise
E Heavy metals in PM intercomparison exercise
F CEN standardization
G Reference material for PM
H QA/QC of field routine measurements



 

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“History”: Quality of Air Pollution Measurements Provisions of the Air Quality Framework Directive 96/62/EC




- Criteria for network design and site selection
- Data quality objectives
- Reference measurement method
- Certification of equipment
- National Reference Laboratory
- Intercomparisons at EU level
- Implementation of quality system



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Proposal for directive on ambient air quality and cleaner air for europe **COM (2005) 447**




Member States shall designate bodies responsible for:

- Assessment of ambient air quality
- Approval of measurement systems
- Ensuring accuracy of measurements
- Analysis of assessment methods
- Coordination on their territory of community wide EC QA programmes
- Cooperation with the other MS and the EC
- **Annex I Section C:**
 - Ensure traceability and stations/network representativeness
 - Ensure QA for data processing
 - NRLs shall be accredited according to ISO 17025, participate in EC intercomparison exercises and equivalence tests


 

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A) AQUILA NETWORK



Air Quality Reference Laboratories

Network Members: 33 National Reference Laboratories from the 27 Member States & EFTA


Observers: Turkey, Croatia

<http://ies.jrc.cec.eu.int/Units/eh/Projects/Aquila/>

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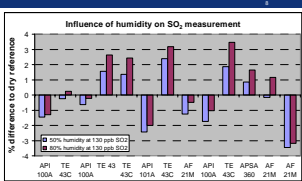
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B) INTERCOMPARISON EXERCISES – INORGANIC GASEOUS AIR POLLUTANTS: CO, NO, NO₂, SO₂, O₃



Example Ozone:

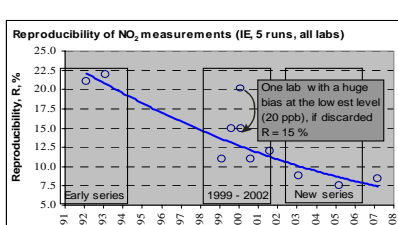
	Standard Reference Photometer	Ozone generating Photometer	Gas phase titration	No standards
satisfactory	100 % (100)	96 % (48)	40 % (6)	100 % (10)
questionable		4 % (2)	60 % (9)	
unsatisfactory				



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B) INTERCOMPARISON EXERCISES

Inorganic gaseous air pollutants: CO, NO, NO₂, SO₂, O₃




Reproducibility, R, %

Improvement of comparability:
 - Use of traceable gas standards
 - Implementation of standardised methods and quality system

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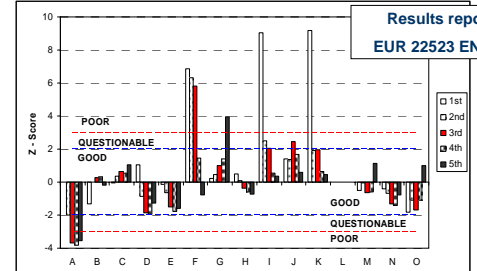
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C) Benzene – BTEX intercomparison with automatic analysers (Oct. 2005)

Laboratory	Country
Institute for Medical Research and Occupational Health	Croatia
Ecole des Mines de Douai	France
Ministry of Environment	Spain
AEA Technology	United Kingdom
SHMI	Slovakia
Central Laboratory of Ambient Air Monitoring, CHMI	Czech Republic
VMM	Belgium
Finnish Meteorological Institute	Finland
Carlos III	Spain
ARSO	Slovenia
Umweltbundesamt GmbH	Austria
ERLAP	EC-DG-JRC

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C) BENZENE – BTEX INTERCOMPARISON WITH AUTOMATIC ANALYSERS (10/05)



Results reported: EUR 22523 EN (2006)


Legend: 1st (white), 2nd (light grey), 3rd (dark grey), 4th (black), 5th (dark grey)

Quality levels: POOR, QUESTIONABLE, GOOD

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D) VOC precursor intercomparison: JRC-AQUILA & Euromet

- 1) Gravimetrically prepared gas cylinder (NPL)
- 2) Gas cylinder containing ambient air matrix (NPL)
- 3) At least 15 compounds had to be analysed in the two cylinders (5 replicates)

ethane	n-pentane (pentane)	benzene
ethylene (ethene)	i-pentane (isopentane or 2-methylbutane)	toluene
acetylene (ethyne)	1-pentene	ethylbenzene
propane	2-pentene	m-xylene
propene	isoprene (2-methyl-1,3-butadiene)	p-xylene
n-butane (butane)	n-hexane (hexane)	o-xylene
i-butane (isobutane or 2-methylpropane)	i-hexane (isohexane or 2-methylpentane)	1,2,4-trimethylbenzene
1-butene	n-heptane (heptane)	1,2,3-trimethylbenzene
trans-2-butene	n-octane (octane)	1,3,5-trimethylbenzene
cis-2-butene	i-octane (2,2,4-trimethylpentane)	
1,3-butadiene		

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09/07: labs sending their results to JRC for data treatment

D) D. VOC "precursor", Participating Laboratories

	Laboratory	Contact person
I	Institute for Atmospheric Pollution - CNR	R. Mabilia
S	VL	A. Potter, E. Brorström-Lunden
Slo	Environmental Agency of the Republic of Slovenia	R. Brinc, M. Bizjak
CH	EMPA	S. Reimann
S	Instituto de Salud Carlos III	R. Fernandez Patier
I	Environmental Protection Agency	B. Cleary, C. O'Donnell
F	Ecole De Mines	N. Locoge
P	Instituto do Ambiente	J. Matos
UK	AEA Technology	S. Telling, P. Dumitrescu
CZ	Czech Hydrometeorological Institute	J. Novak
B	SSaP	M. Gohy
A	Amst der oberösterreichischen Landesregierung - Abt. UUW	A. Schiner
F	Finnish Meteorological Institute	H. Hakola, H. Heinen
A	Umweltbundesamt	M. Froehlich, C. Leeb
B	VMM Flemish Environmental Institute	E. Wauter, K. Van den Berghe
D	NERI	
UK	National Physical Laboratory	M. Milton, P. Quincey, P. Woods
DG -JRC	ERLAP	P. Pérez Ballesta

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Transport & Air Quality Unit

E) Heavy metals in PM intercomparison exercise

Objectives of the inter-comparison exercise

- To assess whether the DQOs of 1st and 4th Directives are met for Pb, As, Cd and Ni
- To evaluate if the differences between labs results and reference values remains within stated uncertainties
- To investigate what are the main sources of uncertainty: e. g. calibration, digestion, analysis and matrix effect
- To evaluate the repeatability/reproducibility of the methods of measurements

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E) Heavy metals in PM intercomparison exercise

Country		NRLs
Belgium	VMM	Flemish Environment Agency (VMM)
Austria	UBA	Umweltbundesamt GmbH (UBA)
France	EMD	Ecole des Mines de Douai (EMD)
Croatia		Institute for Medical Research and Occupational Health
Lithuania	EPA	Environmental Protection Agency (EPA)
Czech Republic	CZMI	Czech Hydrometeorological Institute (CMHI)
Germany	LANUV	North Rhine-Westphalia State Environment Agency (LANUV)
Slovenia	ARSO	Environmental Agency of the republic of Slovenia
Ireland	EPA	Environmental Protection Agency
Poland		Voivodship Inspectorate of Environmental Protection
Finland	FMI	Finnish Meteorological Institute
United Kingdom	NPL	National Physic Laboratory, Analytical Science, Quality of Life Division
EC	JRC	JRC - Institute for Environment and Sustainability

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E) HM in PM, Sample preparation: S1, diluted liquid CRM




S1


- S1, a sample of a diluted liquid CRM for heavy metals. 50-ml PFA flasks to carry out 6 determinations to be repeated on 3 different days with 3 different calibrations
- Elements : Cd, As, Ni, Pb, optional elements: Zn, Cu, Cr, Mn, Co, V
- Determination of analytical/calibration bias
- Evaluation of repeatability/ reproducibility of analytical method

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E) HM in PM, S2/S3, dust CRM sub-samples



S2



S3

- S2, a sample of a certified dust sample, digested by JRC (EN 14902). 25-ml PFA flask to carry out 6 determinations
- S3, a gravimetric sub sample of a dust CRM, to be digested by each lab (6 determinations)
- Elements: Cd, As, Ni and Pb + optional elements: Zn, Cu, Cr, Mn, Fe, Al, V
- Evaluations of analytical/calibrations bias and digestion efficiency on a dust matrix

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E) HM in PM, S4/S5/S6 PM₁₀ filters




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E) HM in PM, Homogeneity of sampling

Place	StartDate	PM ₁₀ µg/m ³	RSD
Ispra	08-Nov-06	38.5	3.9%
Ispra	09-Nov-06	54.2	2.2%
Ispra	16-Nov-06	174.7	1.9%
Milan	13-Dec-06	117.7	2.0%
Milan	14-Dec-06	191.7	2.7%
Milan	18-Dec-06	23.8	6.2%
Milan	19-Dec-06	55.4	3.5%

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E) HM in PM, data treatment



1. z' score to demonstrate the capacity of NRLs to comply with the DQO of the 1st and 4th Daughter Directive
2. En to check that the difference between the NRL values and the reference/assigned value remains within uncertainties
3. r, R of the method of analysis to give an overall judgment of the data quality of intercomparison. (+ between-days r, R / lab)
4. Evaluation of the contribution of digestion, analytical method and calibration to the overall uncertainty

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CEN standardisation

JRC actively participates to a number of WGs of TC 264 (Air quality) in order to facilitate standardization of the reference methods of the European Directives :

- WG 15 PM
- WG 12 inorganic gases
- WG 13 benzene
- WG 14 heavy metals
- WG 21 PAHs
- WG 11 diffusive sampling

JRC only monitors the work in other WGs of lower requirements in Directives: WG 20 (deposition of heavy metals) and 25 (gaseous mercury).




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CEN standardisation

JRC organized the EC WG about the Demonstration of Equivalence of Candidates Methods to reference methods.


Further to the "equivalence project", DG ENV asked JRC to organize in collaboration with the CEN WGs pre-normative work before future standards → New items : gravimetric PM methods and NO₂ measurements by diffusive sampling



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Reference material PM for heavy metal and BaP: current situation

NIST 1648 urban dust (out of stock, high lead)
NIES 8 dust (out of stock, high C)
BCR 723 road dust (road dust, Pd, Pt and Rh)
BCR 605 urban dust (trimethyllead)
NIST 2557 airborne particles (Pt, Rh, Pd)
NIST 1647d BaP
NIST 2783 PM 2.5 on filter for EDXRF
(...)




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Development of new Certified Reference Material

In collaboration with AQUILA: CRM for selected metals and PAH

Currently (09/07), JRC - IRMM is treating the data of feasibility study, for HM probably tunnel dust. Signing Administrative Arrangement with DG ENV


- Matrix very low particle size
- Pb, Cd, Ni, As (Zn, Fe, Cr, V, Cu, K, Pt, La)
- BaP, BaA, DBaH, BbF, BjF, BkF, IcdP
- U = 10 – 15 %



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Quality check of routine monitoring stations

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PM QA/QC campaign - a JRC - AQUILA PROJECT

- To better harmonize PM10 assessment within the EU
- Provide information on comparability of PM10 measurements in the Member States
- Provide information about implementation and validity of correction factors
- Asses the comparability of reference and equivalent methods and the respect of the DQO

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PM QA/QC campaign – Inter-comparison exercises

- Two reference equivalent samplers PM₁₀
- Reference sampler PM_{2.5}
- Sampler PM₁
- Optical particle sizing system (Spectrometer)
- TEOM FDMS (PM₁₀)
- EC/QC semi-continuous

Network monitoring station / NRL / responsible for PM correction factors in Member States:
Min: PM₁₀ reference

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H) HARMONIZATION: MANY DIFFERENT COMPONENTS AND PROGRAMMES -> integrated QA/QC programme

Thank you!

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<http://ies.jrc.cec.eu.int/Units/eh/Projects/Aquila/>
Download reports at :
ftp://ftp_pegasos:pegasos@pegasos.jrc.it/erlap/ERLAPDownload.htm