

Review 1st OGTAC-CC ILC within ACTRIS

- Results provided important input for the technical requirements documentation and the measurement guidelines
- 1st QA/QC activity for ACTRIS NFs measuring particulate organic tracers

*2nd OGTAC-CC community meeting within the framework of the
CAIS-ECAC CF 04/2026*



Main target compounds:

- Levoglucosan
- Mannosan
- Galactosan

- 3x real field samples
 - Triplicate analysis, each sample 3 times full procedure
- 2x aqueous standards (not for the GC laboratories)
 - 3 injections each

- Participants should use their individual analytical measurement setup but need to follow the guidelines given by the CC with respect to:
 - Number of injections
 - Number of sample runs (repetitions)
 - Sequence design
 - Documentation

Participants (alphabetically sorted here, does not correspond to the laboratory code):

Group (NF)	PI/contact	Analytical method
Frankfurt University	Alexander Vogel	GC-MS
INERIS	Hugues Biaudet /Valerie Minguet	HPAEC-PAD
Kosetice	Jaroslav Schwarz	HPAEC-PAD
LGGE	Jean-Luc Jaffrezo / Rhabira Elazzouzi	HPAEC-PAD
LGGE	Jean-Luc Jaffrezo / Rhabira Elazzouzi	LC-MSMS
NILU (Birkenes and Zeppelin)	Karl Espen Yttri	UPLC-Orbitrap
SIRTA	Nicolas Bonnaire	HPAEC-PAD
TROPOS (Melpitz)	Laurent Poulain	HPAEC-PAD
TU Wien (SBO)	Anne Kasper-Giebl	HPAEC-PAD
Vielsalm	Benjamin Bergmans	GC-MS

1) Filter samples

- a) Levoglucosan
- b) Mannosan
- c) Galactosan

2) Standard solutions

- a) Levoglucosan
- b) Mannosan
- c) Galactosan

3) Filter samples

- a) Erythritol, Arabitol and Mannitol
- b) Glucose, Galactose and Mannose
- c) Inositol, Trehalose and Sucrose
- d) Fructose

➤ General mean and mean percentage error

➤ Repeatability and reproducibility standard deviations

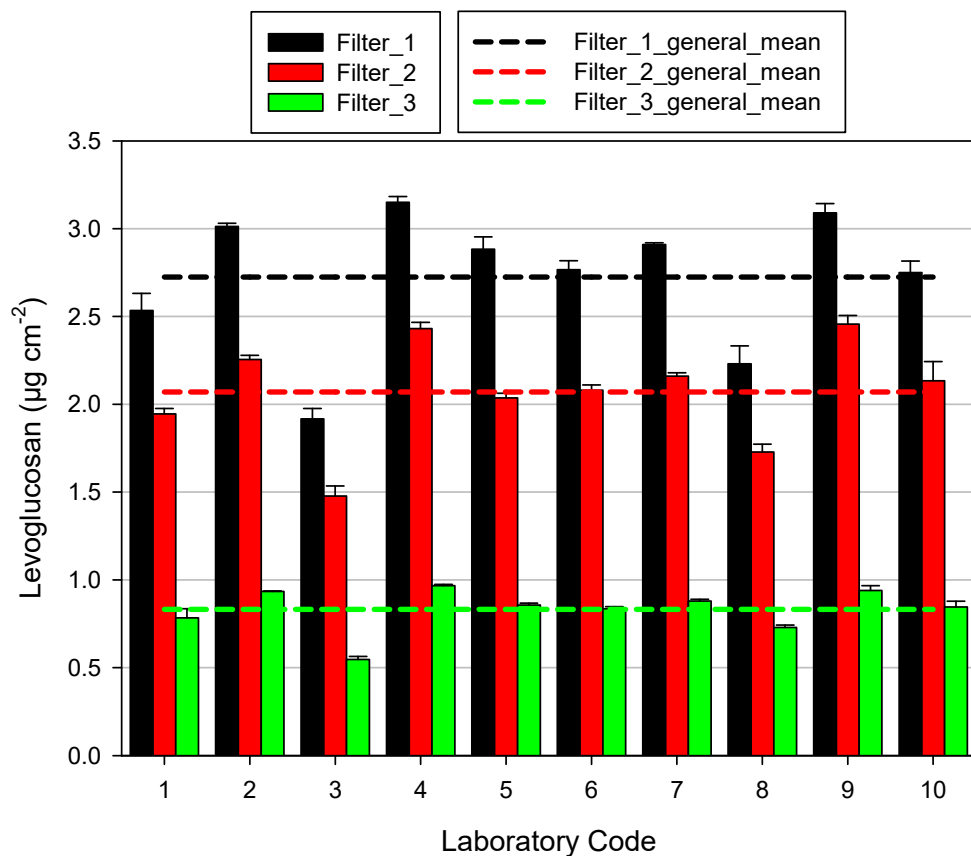
➤ Lab performance test via assigned value and z-score

➤ Impact sample preparation and analytical method

4) Standard solutions

- a) Erythritol, Arabitol and Mannitol
- b) Glucose, Galactose and Mannose
- c) Inositol, Trehalose and Sucrose
- d) Fructose

Results 1st ILC – filter samples: levoglucosan



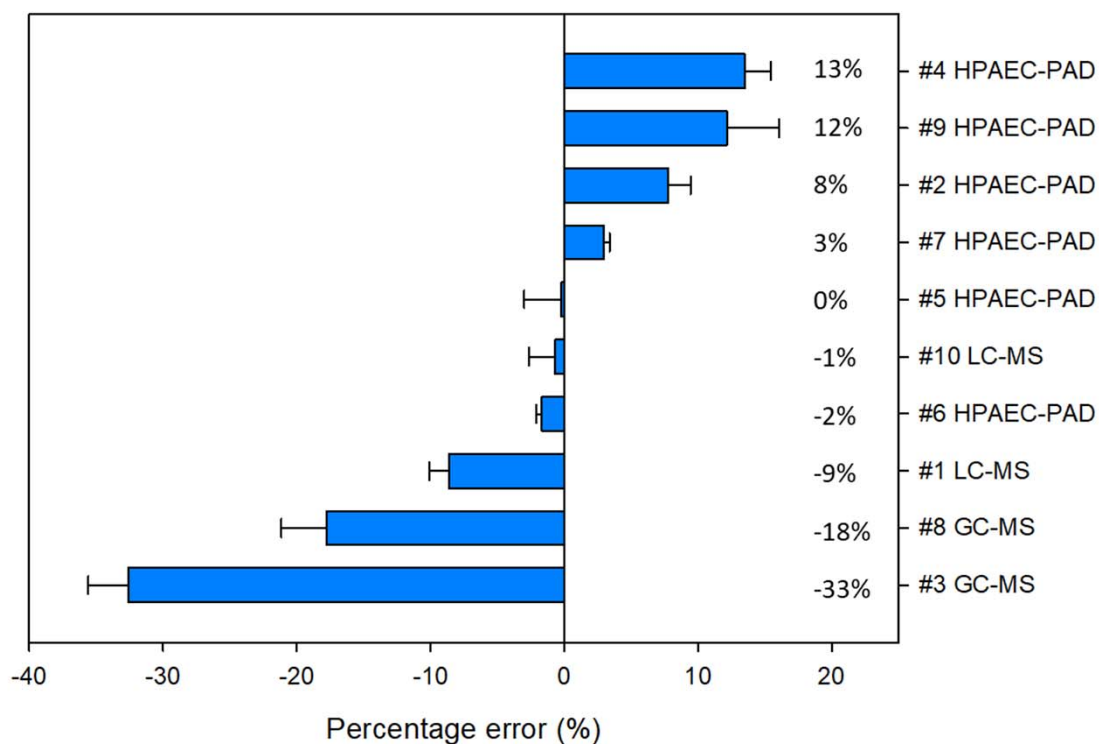
Sample	General mean (µg cm ⁻²)	Standard dev. (µg cm ⁻²)	Standard dev. (%)
Filter_1	2.724	0.393	14
Filter_2	2.070	0.300	14
Filter_3	0.832	0.124	15

- Despite varying sample preparation steps and analytical methods, in general good agreement between all laboratories for levoglucosan
- Standard dev. of the general mean approx. 15% over the whole range of concentration
- Lab 3 and 8 noticeable

TROPOS

Results 1st ILC – filter samples: levoglucosan

$$\text{Percentage error (PE)} = \frac{\text{Measured} - \text{Theoretical}}{\text{Theoretical}} \times 100$$



- PE in the range of -33%-13% with an average of -3% under consideration of all analytical procedures
- Analytical methods tend to be grouped
- Lab 3 and 8 => GC-MS with highest PE indicating an impact of the analytical procedure

TROPOS

Results 1st ILC – filter samples: assigned values and z-score evaluation levoglucosan

Determination of the assigned values following ISO 13528 via Annex C: Robust analysis: Algorithm A

Levoglucosan:

Robust	Filter_1	Filter_2	Filter_3
Average x^*	2.774	2.101	0.847
Standard dev. s^*	0.337	0.273	0.102

Determination of the z-score following ISO 13528 9.4

9.4 z scores

9.4.1 The z score for a proficiency test result x_i is calculated as:

$$z_i = \frac{(x_i - x_{pt})}{\sigma_{pt}}$$

where

x_{pt} is the assigned value, and

σ_{pt} is the standard deviation for proficiency assessment.

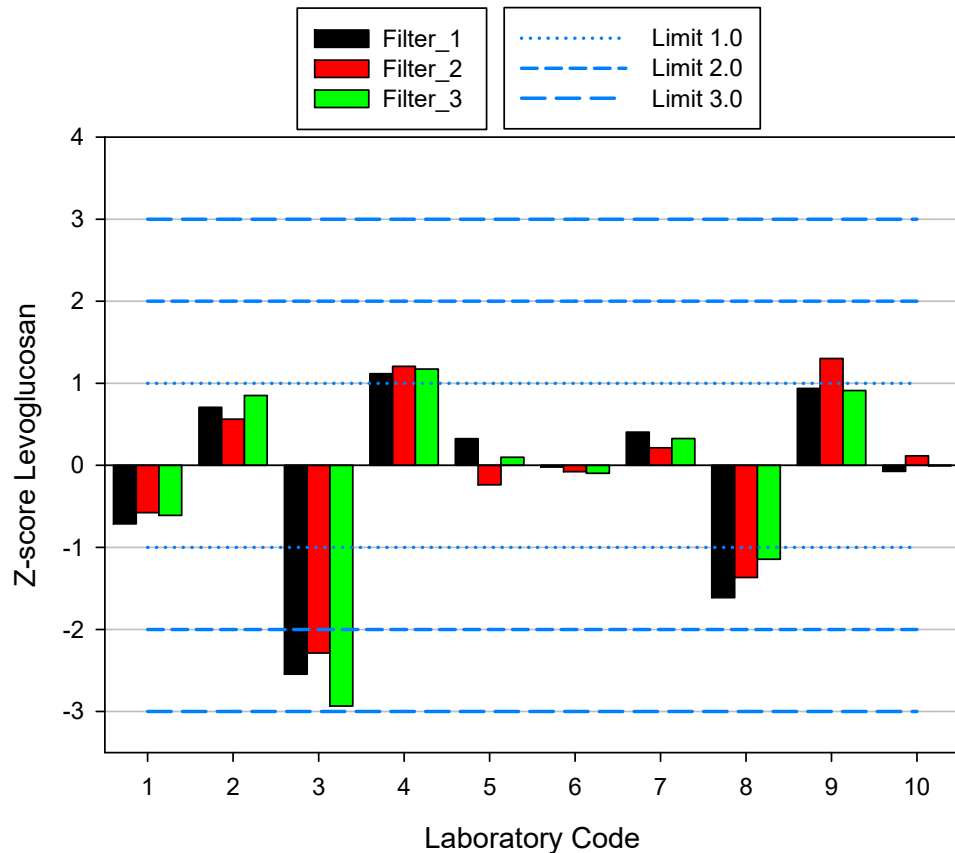
9.4.2 The conventional interpretation of z scores is as follows (see ISO/IEC 17043:2010, B.4.1.1):

- A result that gives $|z| \leq 2,0$ is considered to be acceptable.
- A result that gives $2,0 < |z| < 3,0$ is considered to give a warning signal.
- A result that gives $|z| \geq 3,0$ is considered to be unacceptable (or action signal).

Participants should be advised to check their measurement procedures following warning signals in case they indicate an emerging or recurrent problem.

TROPOS

Results 1st ILC – filter samples: assigned values and z-score evaluation levoglucosan



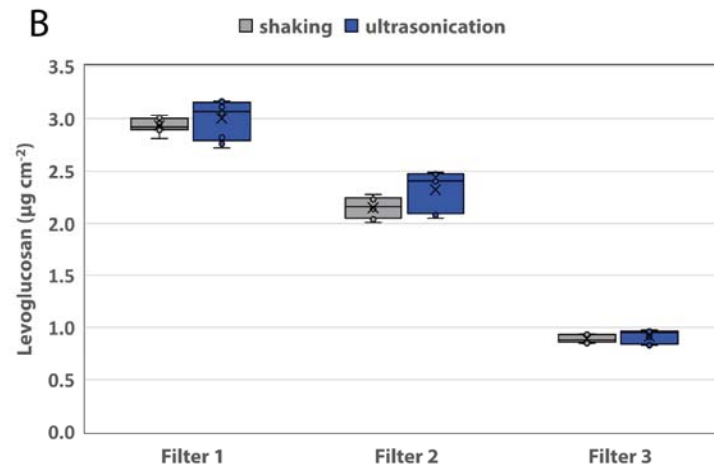
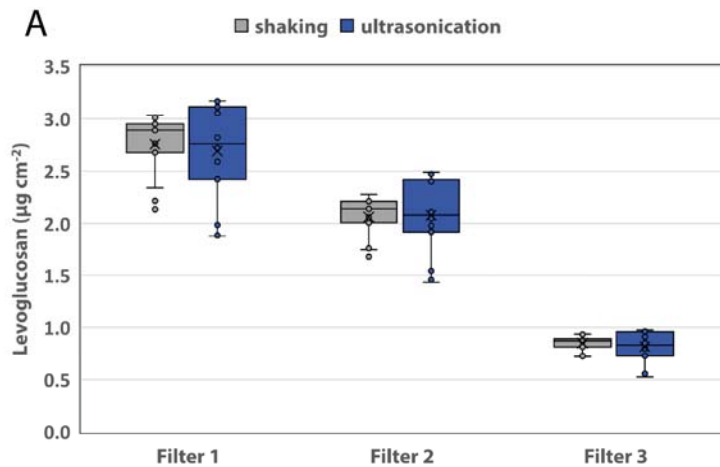
The CC checked the z-score information, if higher than ± 3 the respective laboratory is advised to first check the applied analytical procedure for potential technical issues and second to control the performance of the analytical protocol:

- All laboratories reaches z-scores within ± 3
- Lab 3 and 8 are not exceeding -3, triggering only maximum a warning signal but these data still appear to be in the range of acceptable data
- All participants provided “acceptable” data from the statistical point of view

Results 1st ILC – filter samples: impact sample preparation levoglucosan

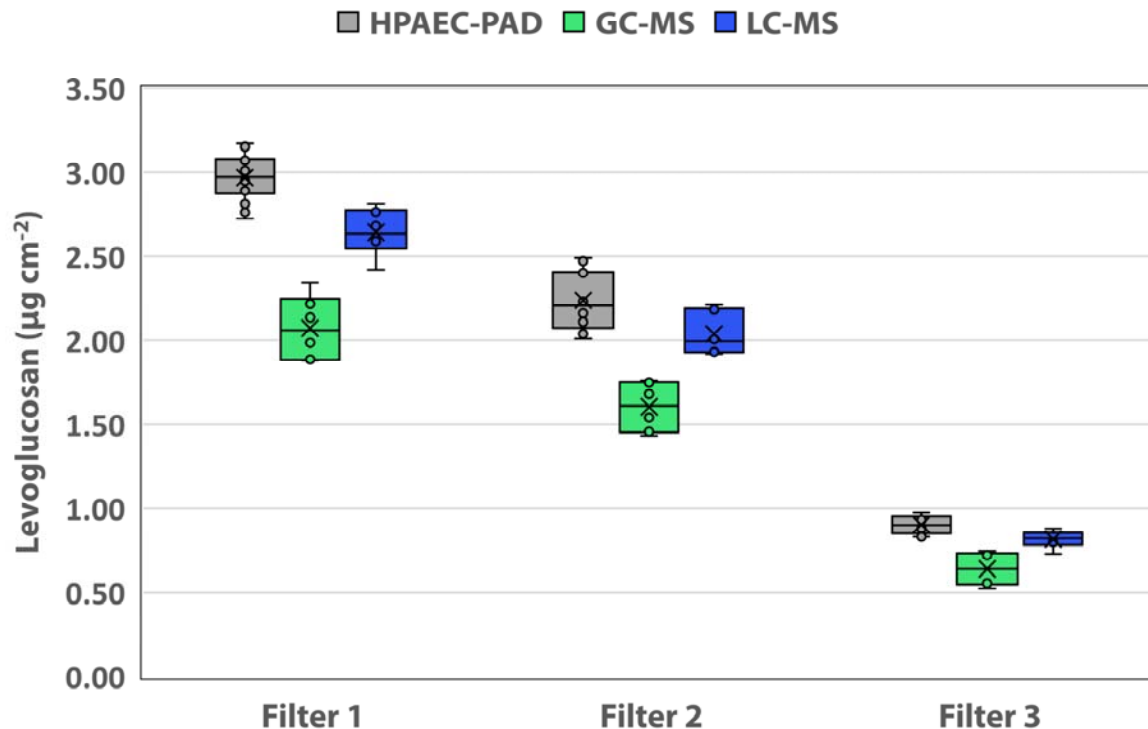
A) All analytical methods (n=5 each)

B) Only for HPAEC-PAD (n=3 each)



- No significant impact ($p > 0.05$) of the sample preparation step independent of the analytical method
- Results confirmed by considering only the same analytical method
- Trend of larger boxes using ultrasonication, but still with relative standard deviations below 20%

Results 1st ILC – filter samples: impact analytical method levoglucosan



- HPAEC-PAD shows the highest results, followed by LC-MS and GC-MS
- All results are significantly different ($p < 0.05$), however overlapping boxes (filter 2 and 3) no clear difference between HPAEC-PAD and LC-MS
- GC-MS shows lowest results potentially due to an additional sample preparation step (derivatization needed), Attention: only two labs used GC-MS

Results 1st ILC – filter samples: summary levoglucosan

- ILC confirms the ability of the mostly used analytical protocols GC-MS, HPAEC-PAD and LC-MS (incl. the corresponding sample preparation steps) to measure levoglucosan in real ambient particle filters
- All participating laboratories provided acceptable data for levoglucosan in all samples in terms of the z-score evaluation, highlighting the already high quality of the currently applied analytical protocols
- Testing the impact of the sample preparation and the analytical method could not clearly identify the “best” analytical protocol confirming the eligibility of using different protocols as also given in CEN 2024 basically describing the application of a protocol for HPAEC-PAD and GC-MS
- Manuscript under review, reviewer comments recently received...

2nd OGTAC-CC community meeting 2026 (online) – Agenda Tuesday April 28	
13:00 - 13:10	Welcome
13:10 - 13:30	General overview / status of OGTAC-CC
13:30 - 14:00	Current status of the Technical Requirements documentation
14:00 - 14:15	Current status of the measurement guidelines documentation
14:15 - 14:30	Instrument data base, offline data workflow, labelling status
14:30 - 14:45	Coffee break
14:45 - 15:00	Review 1 st ILC on BB tracer compounds (<i>modules 1+2</i>)
15:00 - 15:15	Presentation of the latest ILC on SOA tracer compounds (<i>modules 4-6</i>)
15:15 - 15:45	Information about the next ILCs
	a) Biennial ILC on <i>modules 1+2</i> autumn 2026
	b) 1 st ILC on PAHs (<i>module 7</i>) spring 2027
15:45 – 16:00	Open discussion