



## Intercomparison of integrating nephelometers Project No.: IN-2020-2-1

### Basic informations:

Location of the quality assurance: TROPOS, Lab 121

Date: 29 June - 03 July 2020

Principal Investigator	Home Institution	Participant	Instrument
S. Crumeyrolle	LOA	S. Crumeyrolle	14-0141

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## 1 Intercomparison summary

### Status on arrival

No issues due to transportation or other damages.

### Zerocheck

The noise level of the instrument is in the normal range. The average noise ( $1\sigma$ ) for the all wavelengths was less equal  $0.43 \text{ Mm}^{-1}$  for one minute averaging time. The background level was unacceptable with deviations of less equal  $1.73 \text{ Mm}^{-1}$  for all wavelengths.

### Spancheck

The span check was unacceptable with deviations of less equal 12.7%.

## **Inspection**

The measuring cell was contaminated with dust and few larger particles. The measuring cell was cleaned and a full calibration was performed.

## **Comparison to reference nephelometer**

### **Before inspection and recalibration**

The deviations of intercomparisson to reference device were unacceptable with deviations in the range of  $-1.8\%$  to  $11.2\%$ .

### **After inspection and recalibration**

The results from intercomparisson to reference device were acceptable with deviations in the range of  $-0.3\%$  to  $8.6\%$ .

## **Recommendations**

No recommenations.

## **Overall assessment**

The instrument meets the requirements.

## 2 Details

### Configuration parameters

no information available
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### Zerocheck

Table 1: Noise parameters of nephelometer (SN 14-0141) measured with filtered air.

Wavelength [nm]	total scattering		backscattering	
	mean [Mm <sup>-1</sup> ]	std.dev. [Mm <sup>-1</sup> ]	mean [Mm <sup>-1</sup> ]	std.dev. [Mm <sup>-1</sup> ]
450	-0.25	0.38	-0.85	0.3
525	-0.08	0.37	-0.13	0.29
635	-1.73	0.43	-1.27	0.31

### Spancheck

Table 2: Percentage deviation of measured values from nephelometer (SN 14-0141) to theoretical values for CO<sub>2</sub>

Wavelength [nm]	total scattering	backscattering
	deviation [%]	deviation [%]
450	-2.7	-3.4
525	1.9	-0.1
635	-5.2	-12.7

### Comparison to reference nephelometer before inspection and recalibration

Table 3: Comparison of nephelometer (SN 14-0141) to reference nephelometer Aurora4000 (SN 14-1408) before inspection and recalibration. Testaerosol is ammonium sulfate.

Wavelength [nm]	total scattering slope	total scattering R2	backscattering slope	backscattering R2
450	0.982	0.999	0.985	0.999
525	1.038	1	1.021	0.998
635	1.112	0.999	1.082	0.997

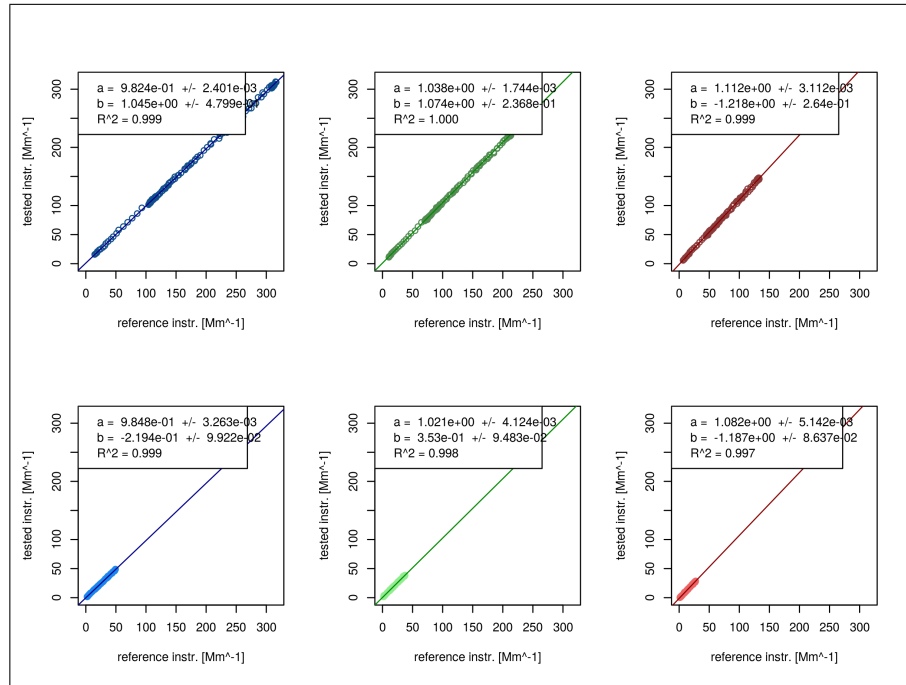


Figure 1: Correlation of scattering coefficients from nephelometer (SN 14-0141) and reference nephelometer Aurora4000 (SN 14-1408) before inspection and recalibration. Testaerosol is ammonium sulfate.

# Comparison to reference nephelometer after inspection and recalibration

Table 4: Comparison of nephelometer (SN 14-0141) to reference nephelometer Aurora4000 (SN 14-1408) after inspection and recalibration. Testaerosol is ammonium sulfate.

Wavelength [nm]	total scattering slope	total scattering R2	backscattering slope	backscattering R2
450	1.003	1	1.014	0.999
525	0.997	1	1.035	0.999
635	1.042	0.999	1.086	0.995

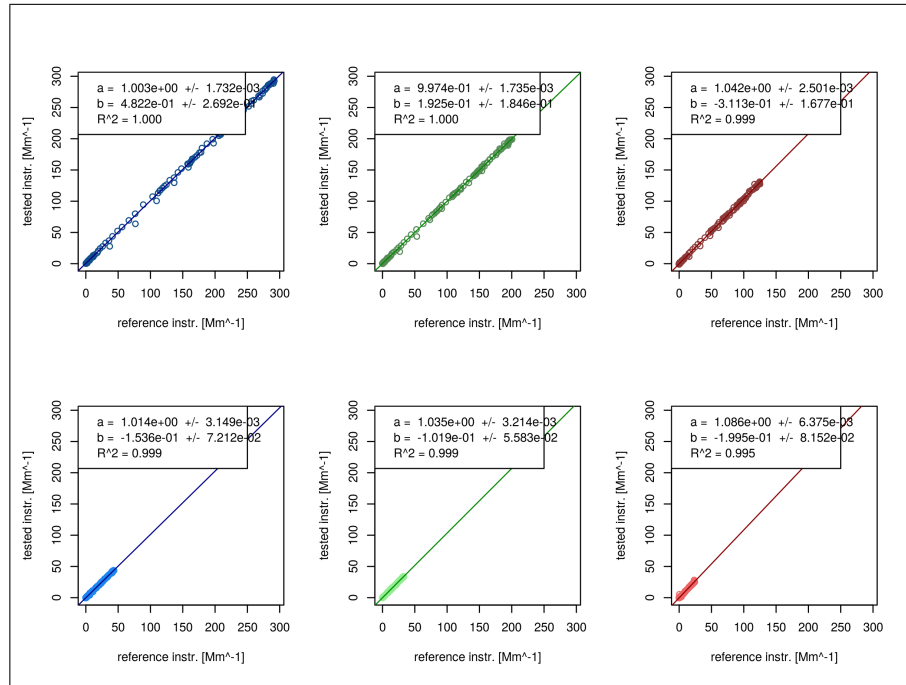


Figure 2: Correlation of scattering coefficients from nephelometer (SN 14-0141) and reference nephelometer Aurora4000 (SN 14-1408) after inspection and recalibration. Testaerosol is ammonium sulfate.