



Intercomparison of Integrating Nephelometers Project No.: IN-2017-3-1

Basic Information:

Location of the quality assurance: TROPOS, lab 121

Date: 15 October, 2017

Principal Investigator	Home Institution	Participant	Instrument
S. Rodriguez	AEMET	S. Rodriguez	Nephelometer, TSI model 3563, SN 70738230

1. Intercomparison summary

Status on arrival: No issues due to transportation or other damages.

Noise: The one minute instrumental noise (single standard deviation) was 0.43 for total scattering and 0.27 for backscattering at wavelength 450 nm and less than 0.23 for the other wavelength and backscattering. The noise level conforms to the expected noise.

Span check: The span check before instrument inspection revealed, that the instrument was properly calibrated with a deviation of 4.9% for total scattering at 450nm and -4.7% for backscattering at 700 nm and less for all other channels.

Comparison to a reference instrument:

Before inspection: Comparison to the reference nephelometer (Aurora 4000, SN 14-1408) showed that scattering coefficients agreed with values from the reference instrument. The deviation is 12% for 700 nm and less equal 5% for all other channels.

After inspection and calibration: For the red channel the deviations have reduced to 9%. For all the other channels the deviation is less equal 2% for total and 6% for backscattering. All deviations are in the acceptable range.

Inspection: Few large white particles were found in the instrument. The flocked paper and the shutter were contaminated with dust.

Recommendations: No recommendations.

Overall assessment: The instrument meets the requirements.

2. Details

Instrument noise						
The noise is determined by the standard deviation of a time series of 4 times 30 minutes with a temporal resolution of 1 minute. Test aerosol was filtered room air.						
	total scattering in Mm^{-1}			backscattering in Mm^{-1}		
Wavelength in nm	450	550	700	450	550	700
Zero check (average in Mm^{-1})	0.42	0.19	0.21	-0.98	0.01	0.05
Noise (standard deviation)	0.43	0.22	0.18	0.27	0.14	0.13

Span check						
Percentage deviation to theoretical value. A positive number means that the instrument measure too high values.						
	total scattering			backscattering		
Wavelength [nm]	450	550	700	450	550	700
before recalibration (as instrument arrived) deviation [%]	4.9	1.8	0.7	2.0	-1.5	-4.7

Comparison to reference instrument before inspection						
Reference nephelometer: Aurora4000 (SN 14-1408)						
Test aerosol: ammonium sulphate						
Measurements were done before inspection and recalibration.						
(*) See span check results. Scattering coefficients were interpolated to the wavelengths of the reference nephelometer.						
	total scattering			backscattering		
Wavelength in nm	450	525(*)	635(*)	450	525(*)	635(*)
slope	0.99	0.97	0.88	0.95	0.95	0.90
R ²	0.998	0.998	0.997	0.995	0.996	0.991

Comparison to reference instrument after inspection						
Reference nephelometer: Aurora4000 (SN 14-1408)						
Test aerosol: ammonium sulphate						
Measurements were done after inspection and recalibration.						
(*) See span check results. Scattering coefficients were interpolated to the wavelengths of the reference nephelometer.						
	total scattering			backscattering		
Wavelength in nm	450	525(*)	635(*)	450	525(*)	635(*)
slope	1.00	0.98	0.91	0.95	0.94	0.91
R ²	0.996	0.999	0.999	0.996	0.997	0.994