Onsite-Intercomparison of Mobility Particle Size Spectrometers

Project No.:	*OSIA-2018-2-6*
Principal Investigator:	Maik Merkel
Home Institution:	*TROPOS* *Permoserstrasse 15* *D-04318 Leipzig / Germany*
Participant:	Maik Merkel
Candidate:	**CZ-TROPOS Usti**
Made by:	**TROPOS**
Counter (SN):	TSI CPC Model 3772, SN: 3772121405
Software:	LabView version 4.7.2
Location of the quality assurance:	Measurement Site Usti nad Labem/Czech Republic
Comparison period:	Dec 03, 2018 – Dec 05, 2018
Last Intercomparison (with Project No.):	

Leibniz-Institut für Troposphärenforschung e.V.
Telefon: +49 341 2717-7060
Telefax: +49 341 2717-99-7060
info@tropos.de
http://www.tropos.de

Commerzbank Leipzig
KTO 102 14 50
BLZ 860 400 00
IBAN: DE77 8604 0000 0102 1450 00
SWIFT CODE: COBADEFF 860

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Summary of Intercomparison:

Final-Status:
During the final performance the CZ-TROPOS MPSS Usti showed a concentration 2% lower than the DE-TROPOS Reference Instrument No.4. The candidate achieved good results for the calibration procedure. The instrument passed the quality targets of ACTRIS and GAW.

Information about the instruments:
Date of check: Dec 03, 2018

List of Components	TROPOS Reference MPSS No.4	TROPOS Reference MPSS No.	Candidate
Position	-	-	-
Company	TROPOS	-	TROPOS
Software	TROPOS	-	TROPOS V4.7.2
CPC-MPSS	TSI CPC, Model 3010	-	TSI CPC, Model 3772
CPC-total	-	-	-
flow ratio	1.0 : 5.0	-	1.0 : 5.0
source	Kr85	-	Kr85
HV power supply	positive	-	positive
DMA	Hauke medium	-	Hauke medium
aerosol dryer	✓	-	✓
aerosol RH- sensor	✓	-	✓
aerosol T-sensor	✓	-	✓
sheath RH-sensor	✓	-	✓
sheath T-sensor	✓	-	✓
Sheath dryer	✓	-	✓
pressure sensor	✓	-	✓
info			

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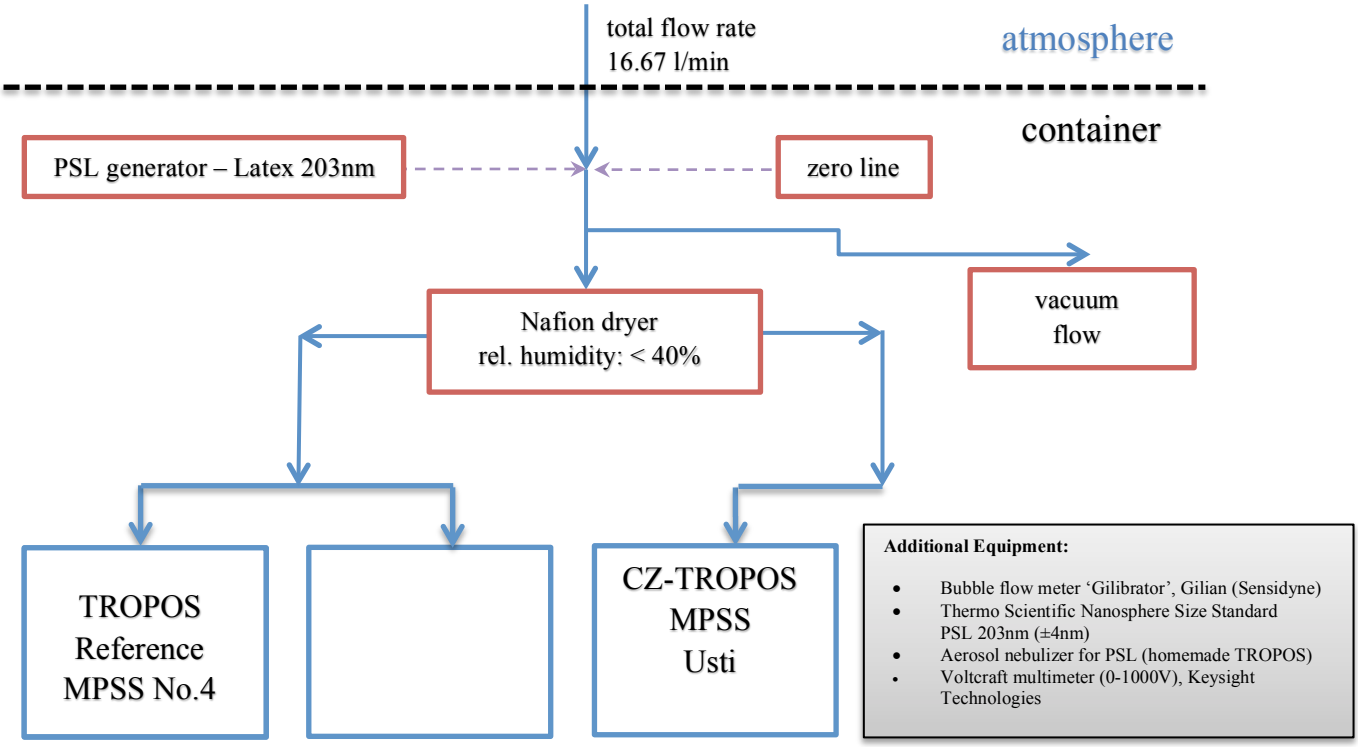
intercomparison setup:



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Status of the instruments:

Date of check: Dec 03, 2018

CPC status	MPSS Usti		Total CPC	
power/status	green	-	-	-
saturator temp	39.0	°C	-	°C
condenser temp	22.0	°C	-	°C
optics temp	40.0	°C	-	°C
cabinet temp	38.1	°C	-	°C
ambient pressure	98.3	kPa	-	kPa
orifice pressure	75.6	kPa	-	kPa
nozzle pressure	2.4	kPa	-	kPa
laser current	46	mA	-	mA
liquid level	full	-	-	-

Date of check: Dec 03, 2018

CPC status	MPSS Reference 4		Total CPC	
power/status	green	-	-	-
saturator temp	Ok	°C	-	°C
condenser temp	Ok	°C	-	°C
optics temp	Ok	°C	-	°C
cabinet temp	-	°C	-	°C
ambient pressure	-	kPa	-	kPa
orifice pressure	-	kPa	-	kPa
nozzle pressure	-	kPa	-	kPa
laser current	Ok	mA	-	mA
liquid level	full	-	-	-

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Date of system checks:

date	03.12.2018 Reference 4	03.12.2018 Usti			unit
total CPC flow	-	-			l/min
aerosol flow (DMA)	-	-			l/min
aerosol flow (UDMA)	-	-			l/min
aerosol flow (total)	1.010	0.997			l/min
Zero MPSS	0	2			#/cm³
Zero total CPC	-	-			#/cm³
PSL 203 nm	203.82	202.58			nm
HV – 0 V	0.0	0.3			V
HV – 5 V	4.9	5.0			V
HV – 100 V	100.2	100.5			V
HV – 1000 V	1001.4	1000.8			V

Special Information regarding the Candidate:

Was it necessary to:	yes/no (date)	old part (ID/SN)	new part (ID/SN)	information
clean the aerosol inlet	no			
change aerosol Nafion dryer	no	-	-	-
change sheath Nafion dryer	no	-	-	-
check source	no	-	-	-
change HV power supply	no	-	-	-
clean/change DMA	no	-	-	-
change aerosol RH/T-sensor	no	-	-	-
change sheath RH/T-sensor	no	-	-	-
change pressure sensor	no	-	-	-
change inlet Nafion dryer	no	-	-	-
Total filter	no	-	-	-

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PSL Scan and calibration: Latex 203 nm +/- 4 nm

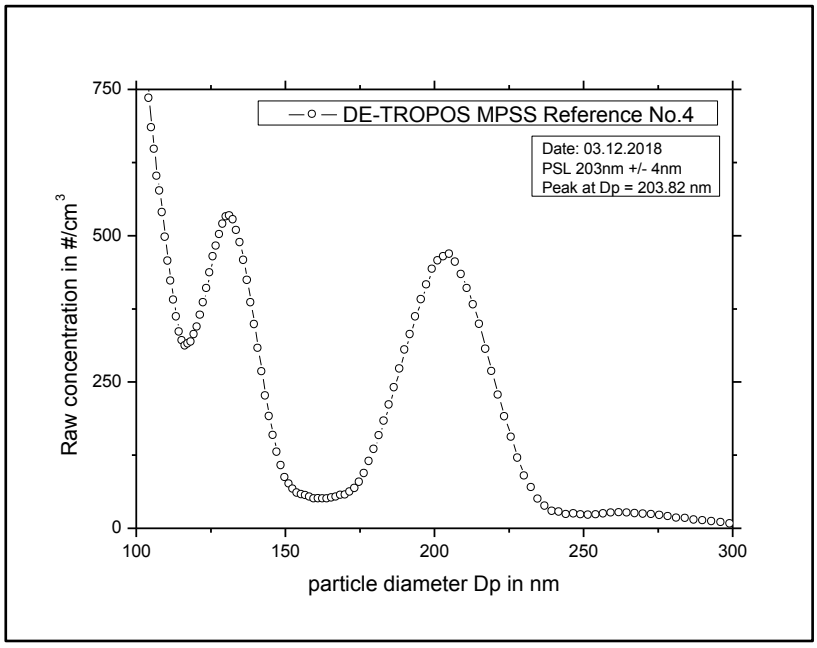

Figure 01: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Dec 03, 2018 for the DE-TROPOS MPSS Reference 4 instrument.

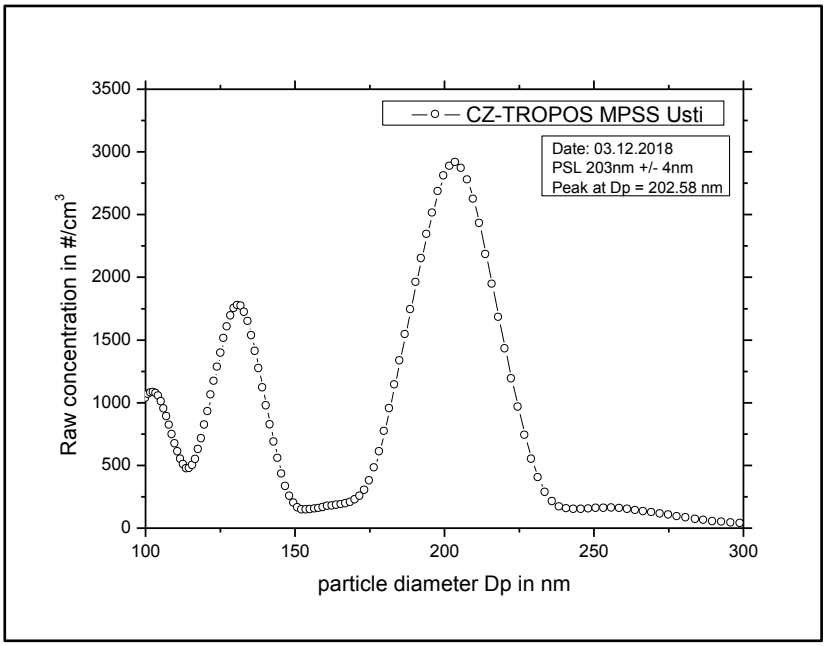

Figure 02: Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on Dec 03, 2018 for the CZ-TROPOS MPSS Usti instrument.

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Final Performance of the Candidate: Particle Number Size Distribution

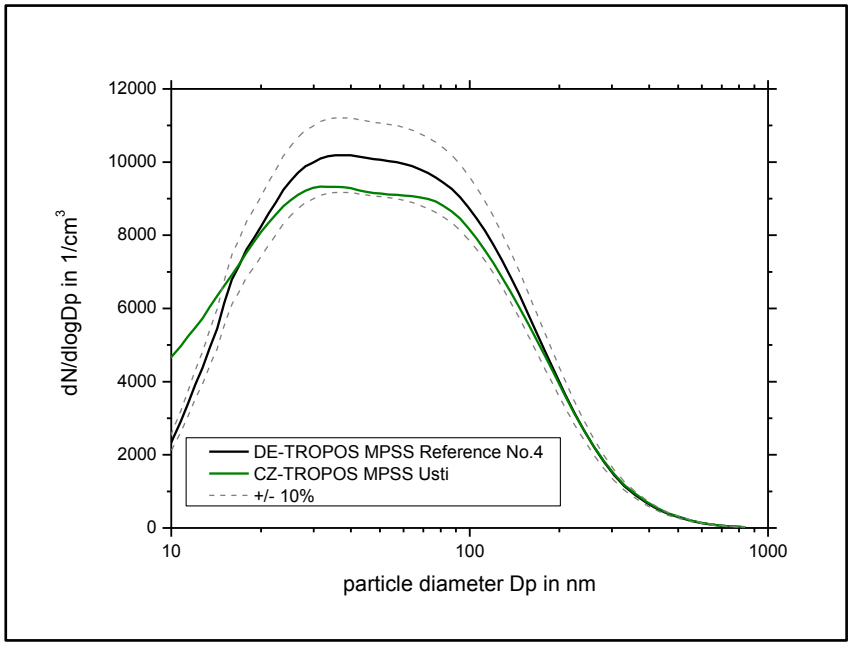

Figure 03: Comparison of mean particle number size distribution of CZ-TROPOS MPSS Usti against DE-TROPOS MPSS Reference No.4 from Dec 03, 2018 10:00 AM – Dec 05, 2018 08:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included.

Final Performance of the Candidate: Time Series

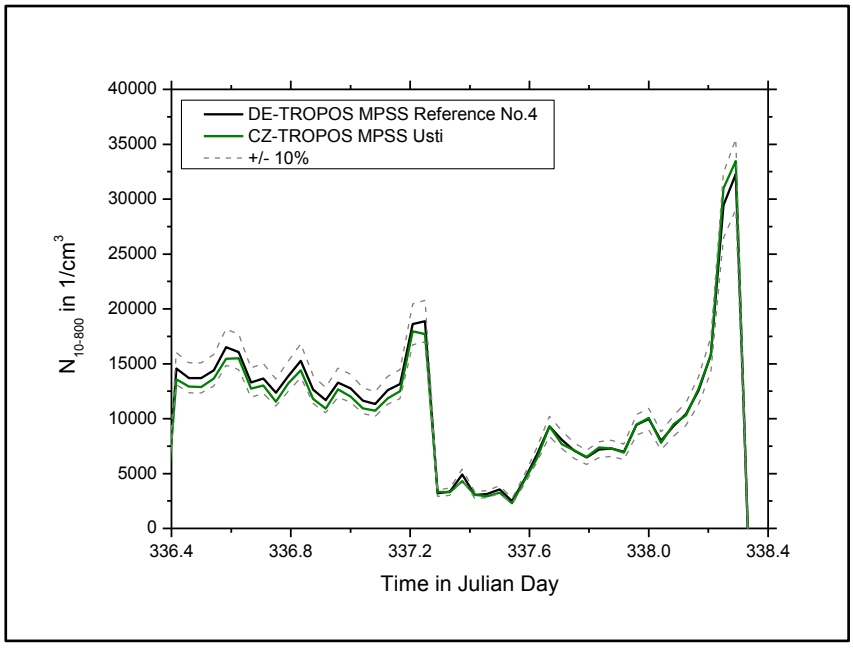

Figure 03: Time series (Dec 03, 2018 10:00 AM – Dec 05, 2018 08:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the two MPSS. The inversion for the candidate was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

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Final Performance of the Candidate: Correlation

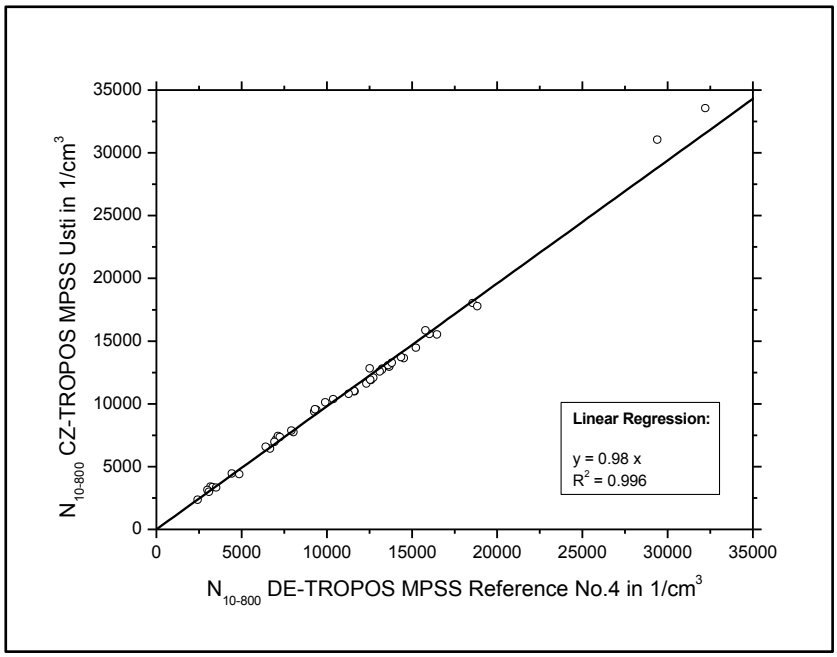

Figure 06: Linear regression between the number concentrations of the DE-TROPOS MPSS Reference No.4 and CZ-TROPOS MPSS Usti. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

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