

## Intercomparison of Mobility Particle Size Spectrometers

*Project No.:* MPSS-2022-WCCAP-112

*Principal Investigator:* Kay Weinhold

*Home Institution:* TROPOS

*Participant:* -

*Candidate:*

*Made by:* TROPOS

*Counter (SN):* TSI CPC Model 310, SN: 2046 (2012)  
TSI CPC Model 3772, SN: 154301 (2016)

*Software:* TROPOS TSMPS 7.0/Radon system version  
Total

*CPC:* -

*Location of the quality assurance:* TROPOS Leipzig, lab 118

*Comparison period:* January 10, 2022 – February 28, 2022

*Last Intercomparison (with Project No.):* -

### Summary of Intercomparison

*Status:*

The candidate passed the quality standards of ACTRIS and GAW during the intercomparison. The system is within the range of +/-10% of the TROPOS Reference MPSS.

The candidate was in a good status. It was not necessary to change or repair parts of the inlet, instrument or counter. The zero, high voltage and PSL checks are in the correct range of tolerance.

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## Information about the instruments:

Date of check: 13.01.2022

<i>List of Components</i>	TROPOS Reference MPSS No.1	Candidate
<i>Position</i>	-	-
<i>Company</i>	TROPOS	TROPOS
<i>Software</i>	TROPOS	TROPOS
<i>CPC-MPSS</i>	TSI CPC, Model 3750	TSI CPC, Model 3010 TSI CPC Model 3772
<i>CPC-total</i>	TSI CPC, Model 3750	-
<i>flow ratio</i>	1.0 : 5.0	1.0 : 5.0 15:1.0
<i>source</i>	Ni-63	Kr85
<i>HV power supply</i>	positive	Positive
<i>DMA</i>	Hauke medium	Hauke medium Hauke short
<i>aerosol dryer</i>	✓	✓
<i>aerosol RH- sensor</i>	✓	✓
<i>aerosol T-sensor</i>	✓	✓
<i>sheath RH-sensor</i>	✓	✓
<i>sheath T-sensor</i>	✓	✓
<i>Sheath dryer</i>	✓	✓
<i>pressure sensor</i>	✓	✓

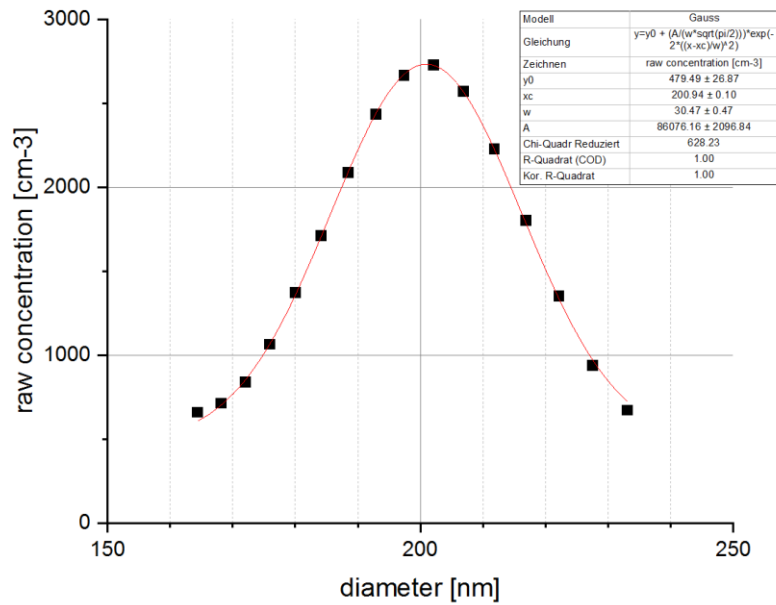
Date of check: 15.01.2022

<i>CPC status</i>	TROPOS-MPSS	TROPOS-total	Candidate-UCPC	Candidate-CPC
<i>power/status</i>	LED green	LED green	LED green	LED green
<i>saturator temp</i>	39 °C	39 °C	39.0	
<i>condenser temp</i>	24.1 °C	23.6 °C	15.0	
<i>optics temp</i>	40 °C	40 °C	40.0	
<i>cabinet temp</i>	24.3 °C	22.7 °C	27.3	
<i>ambient pressure</i>	101.7 kPa	101.9 kPa	102.5 kPa	
<i>orifice pressure</i>	78.0 kPa	78.3 kPa	54.8 kPa	
<i>nozzle pressure</i>	2.37 kPa	2.54 kPa	-0.3 kPa	
<i>laser current</i>	39 mA	42 mA	44 mA	
<i>liquid level</i>	full	- <u>2</u> full	full	full

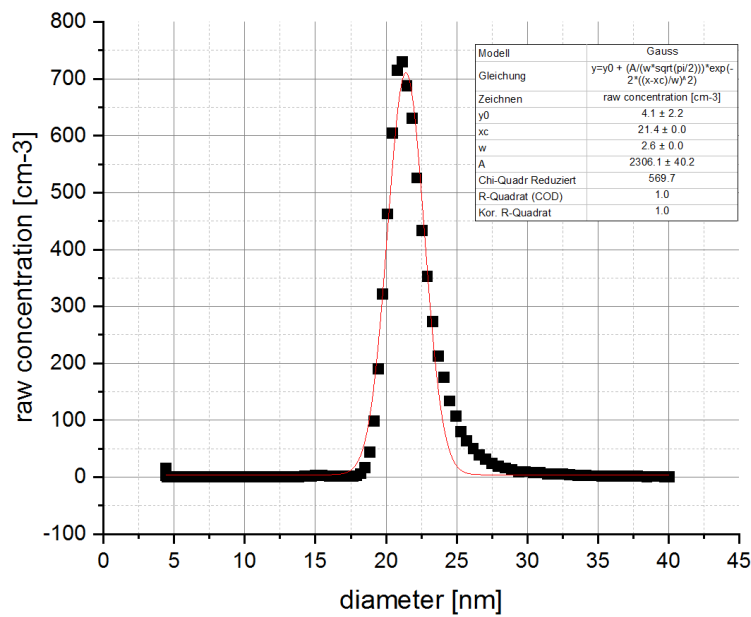
Date of check: 13.01.2022

<i>date</i>	<b>TROPOS Reference MPSS</b>		<b>Candidate MPSS</b>	
	<b>pre- status</b>	<b>final- status</b>	<b>pre- status</b>	<b>final- status</b>
<i>aerosol flow (total)</i>	-	0.98 l/min	-	0.97 l/min
<i>zero</i>	-	0 #/cm <sup>3</sup>	-	0 #/cm <sup>3</sup>
<i>HV – 0 V</i>	-	0 V	-	0 V
<i>HV – 4 mV</i>	-	4.91 V	-	5.1 V
<i>HV – 80 mV</i>	-	99.9 V	-	99.7 V
<i>HV – 800 mV</i>	-	999.9 V	-	1000.1 V
<b>Candidate Nano-MPSS</b>				
<i>date</i>	<b>pre- status</b>	<b>final- status</b>		
<i>aerosol flow (total)</i>	-	1.01 l/min		
<i>zero</i>	-	0 #/cm <sup>3</sup>		
<i>HV – 0 V</i>	-	0.0 V		
<i>HV – 15 mV</i>	-	5.1 V		
<i>HV – 50 mV</i>	-	17.5V		
<i>HV – 100 mV</i>	-	35.1 V		
<i>HV – 1000 mV</i>	-	350.3 V		

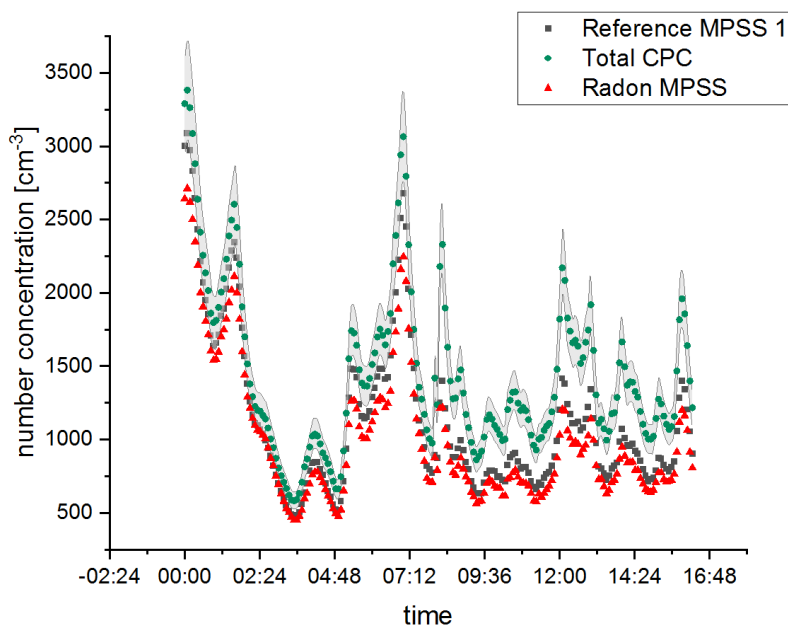
Special Information regarding to the Candidate: n/a



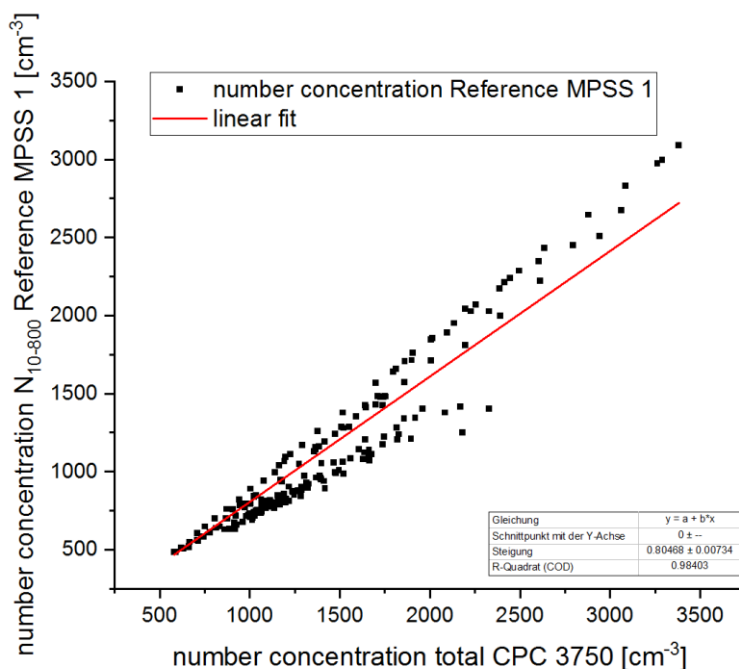
**Figure 01:** Measurement of latex particles with a nominal diameter of 203 +/- 3 nm Radon MPSS. Particle size distribution of latex 203 nm on January 13<sup>th</sup> 2022. The peak shows at 203.6nm.



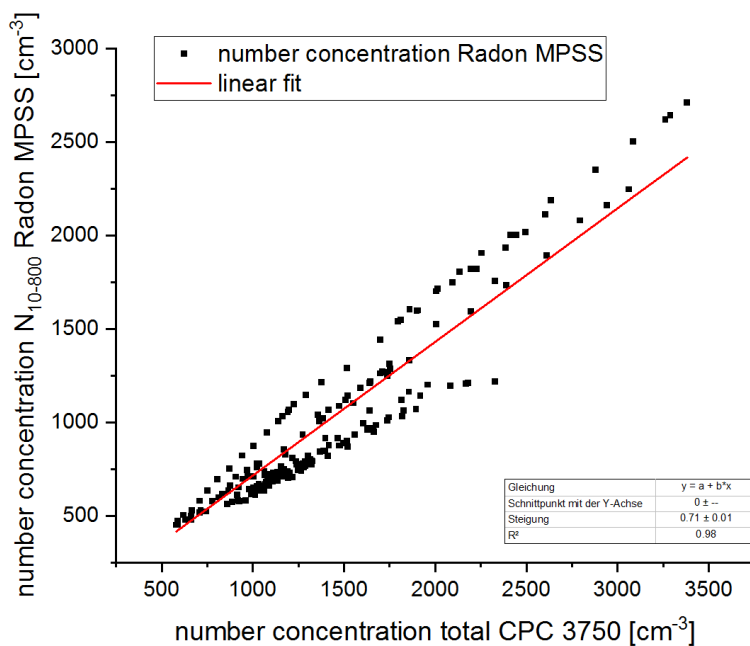
**Figure 02:** Measurement of 20 nm silver particles Radon Nano-MPSS. Particle size distribution on January 13<sup>th</sup> 2022. The peak shows at 21.4 nm.



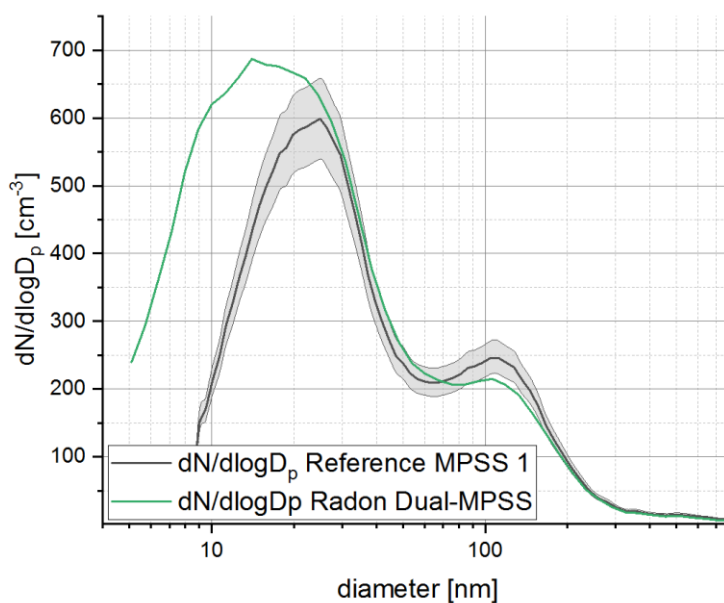
**Figure 03:** Time series (20.02.2022 00:00 AM – 20.02.2022 04:15 PM) of the integrated particle number concentration ( $N_{10-800}$ ) of the Radon MPSS (red), integral particle number concentration ( $N_{10-800}$ ) of the Reference MPSS 1 (black) and number concentration measured by the total CPC 3750. Gray shaded areas represent  $\pm 10\%$  of the total CPC concentration. Multiple charge correction, internal diffusion losses, CPC flow corrections.



**Figure 04:** Scatter plot of the number concentration  $N_{10-800}$  measured by the Reference MPSS 1 versus number concentration measured by the total CPC 3750.



**Figure 05:** Scatter plot of the number concentration  $N_{10-800}$  measured by the Radon MPSS versus number concentration measured by the total CPC 3750.



**Figure 06:** Average inverted particle number size distribution of ambient air January 28<sup>th</sup> 2022; The green line represents measurement by the Radon Dual-MPSS, black line is average for the TROPOS reference MPSS 1. The gray shaded area represents Reference MPSS 1 concentrations +/-10%.