Intercomparison of Mobility Particle Size Spectrometers

Project No.:	MPSS-2020-1-2
Principal Investigator:	Jan Kaiser
Home Institution:	University of East Anglia
Participant:	-
Candidate:	
Made by:	**Grimm**
Counter (SN):	54300411
Location of the quality assurance:	TROPOS Leipzig, lab 118
Comparison period:	April 01, 2020 – April 03, 2020
Last Intercomparison (with Project No.):	

Summary:

The candidate did not pass the standards of ACTRIS and GAW. TROPOS recommends that the instrument should be checked by the manufacturer. The issues presented here should be discussed between the user, TROPOS, and the manufacturer in detail. The main issues are as follows:

1. Sizing efficiency: Upon sizing check with 203 nm PSL particles, the candidate showed a peak at 195 nm.

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2. The PNSD from the candidate also shows a peak shifted to the lower size range when compared against the reference instrument.
3. While the time series of the integrated total PNC shows good agreement with the Reference Total CPC, the PNSD showed an overestimation in the Aitken mode and an underestimation in the accumulation mode.

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Status April 01, 2020

Table No. 1:

Institute: ***GRIMM***							
Station:							
Date of checking list: ***April 01, 2020***							
Instrument/ Components	*info*	*SN*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**GRIMM**	**54300411**	**5.403**	*ST*	-	*OFF*	
Firmware Classifier:	-			*CT*	-	*4mv*	
Firmware Software:	**GRIMM**		**V1-7-2**	*OT*	-	*800mv*	
DMA type:	**GRIMM**			*CabT*	-	*200mv*	
CPC model:				*AP*	-	*0*	
Firmware CPC:	-		-	*OP*	-		
radioactive source:	**Kr85**	-	-	*NP*	-		
Flow CPC (l/min):				*LC*	-		
Flow Inlet (l/min):	**0.3**						
Sheath air flow (l/min):	**3.0**						
Zero (#/cm³):	**0**						
Maintenance							
Aerosol inlet:	**No changes**						
Aerosol Nafion dryer:	**No changes**						
Sheath Nafion dryer:	**No changes**						
Source:	**From TROPOS**						
HV power supply:	**No changes**						
DMA:	**Long DMA GRIMM**						
Aerosol/sheath RH/T- sensor:	**No changes**						
Pressure sensor:	**No changes**						
Filter:	**No changes**						
NI-card:	**No changes**						
CPC:	**No changes**						
Impactor:	**No changes**						
Setup settings over night:	**DMA Pressure: 1007/23°C; DMA Effective lengths 3.5 m; inlet system effective lengths 0.38 m**						

Institute: **TROPOS**							
Station: **Reference Instrument No.1**							
Date of checking list: **April 01, 2020**							
Instrument/ Components	*info*	*Serial Number*	*Date/Code*	*CPC-Status*		*HV-Status*	
MPSS/Classifier:	**TROPOS**	**No.1**		*ST*	**39.0**	*0 V*	**0**
Firmware Classifier:				*CT*	**22.0**	*5 mV*	**4.99**
Firmware Software:	**TROPOS 6.68**			*OT*	**40.0**	*800 mV*	**999.9**
DMA type:	**Hauke medium**		**142**	*CabT*	**28**	*200 mV*	**250.1**
CPC model:	**TSI 3772**	**3772141701**		*AP*	**100.1**	*0 V*	**0**
Firmware CPC:	**2.15**			*OP*	**78.0**		
Radioactive source:	**Kr.85**	**NER 8275**	**002/13**	*NP*	**2.8**		
Flow Inlet (l/min):	**0.990**			*LC*	**50**		
Zero (#/cm³):	**0**						

Institute: **TROPOS**					
Station: **Reference T-CPC**					
Date of checking list: ***April 01*****, 2020**					
Instrument/ Components	*info*	*Serial Number*	*Cut off*	*CPC-Status*	
CPC model:	**TSI 3772**		**D_{p50} 10 nm**	*ST*	
Firmware CPC:	**2.15**			*CT*	
Flow Inlet (l/min):	**1.024**			*OT*	
Zero (#/cm³):	**0**			*CabT*	
				AP	
				OP	
				NP	
				LC	

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PSL Scan: Latex 203 nm +/- 4 nm

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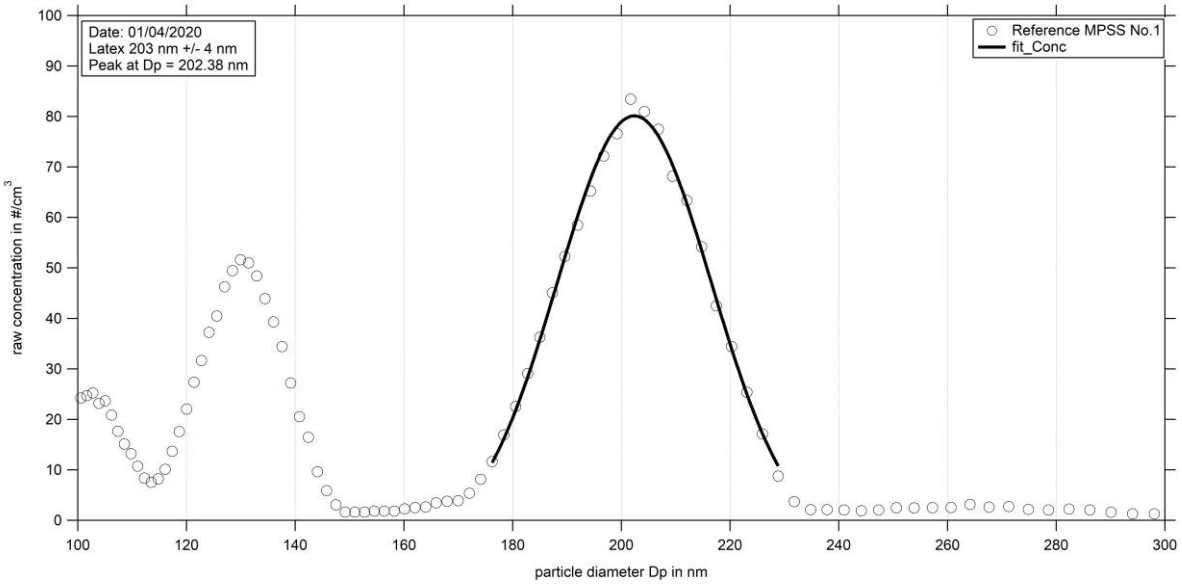

Figure 01: Measurement of latex 203 nm – TROPOS Reference Instrument No. 1: Particle size distribution of latex 203 nm on February 28th, 2020. The peak shows at 202.38nm

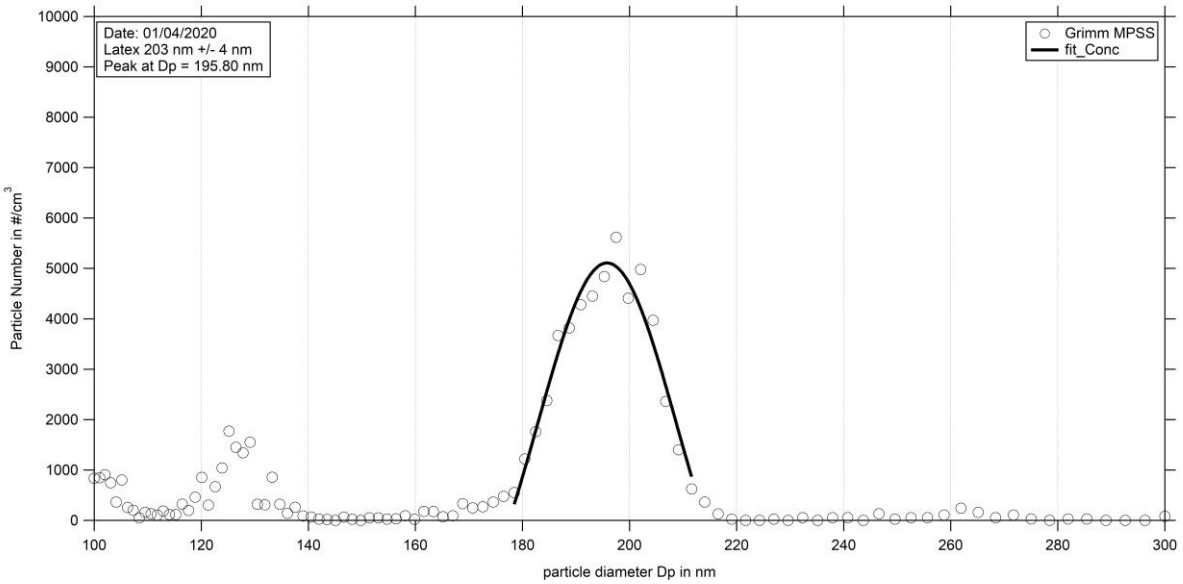

Figure 02: Measurement of latex 203 nm – MPSS Grimm: Particle size distribution of latex 203 nm on February 28th, 2020. The peak shows at 195.80nm.

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Intercomparison between TROPOS Reference Instrument No. 1 and MPSS Grimm 01.04.2020 18:00PM – 03.04.2020 06:00AM

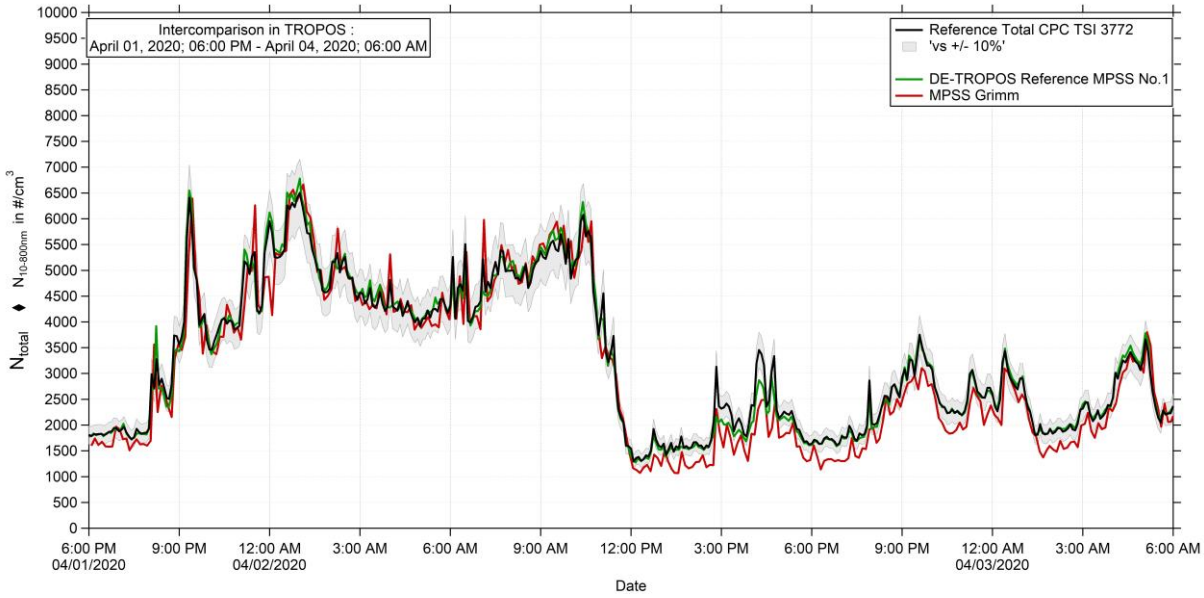

Figure 03: Time series (Apr. 01, 2020 6 PM – Apr. 03, 2020 6 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the MPSS and total number concentration (N_{total}) of the Reference TSI-CPC Model 3772. Multiple charge correction, internal diffusion losses, CPC flow corrections. The candidate is running with the TSI Kr.85 source.

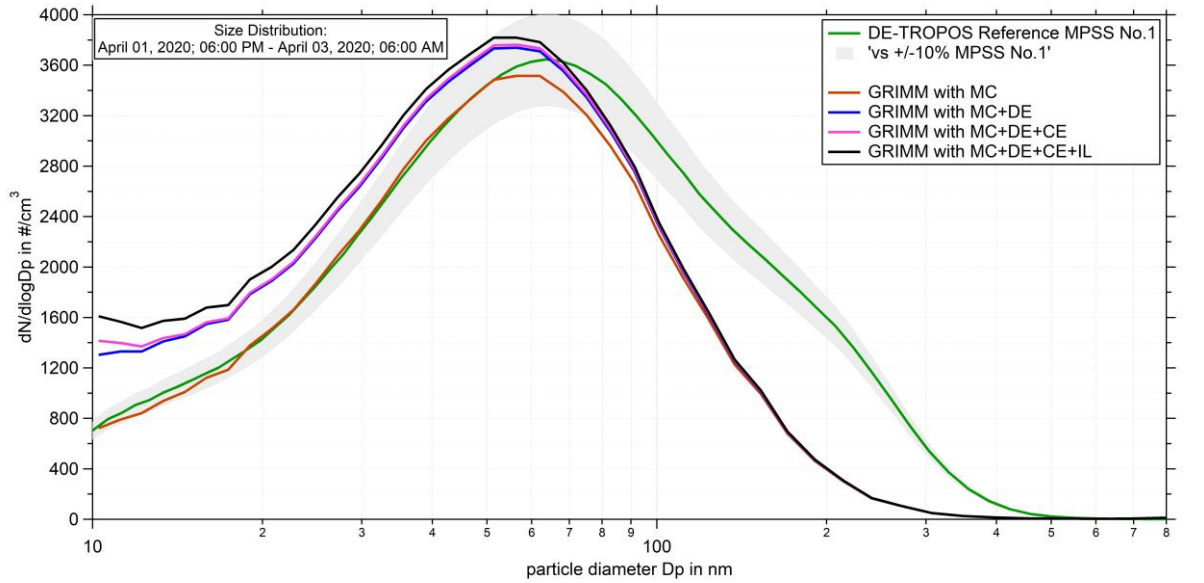

Figure 04: Particle size distribution for TROPOS Reference MPSS No.1 and MPSS Grimm, flow corrections, multiple charge correction and diffusion loss corrections are included.

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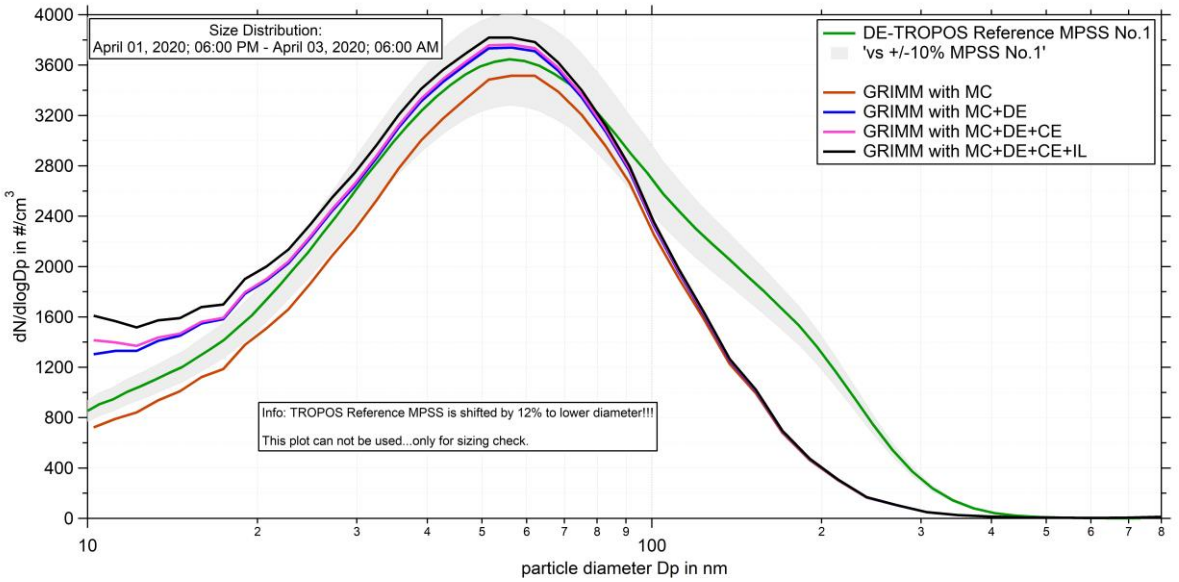

Figure 05: Particle size distribution for TROPOS Reference MPSS No.1 and MPSS Grimm. TROPOS reference instrument No.1 is shifted by 12% to lower diameter. Flow corrections, multiple charge correction and diffusion loss corrections are included.

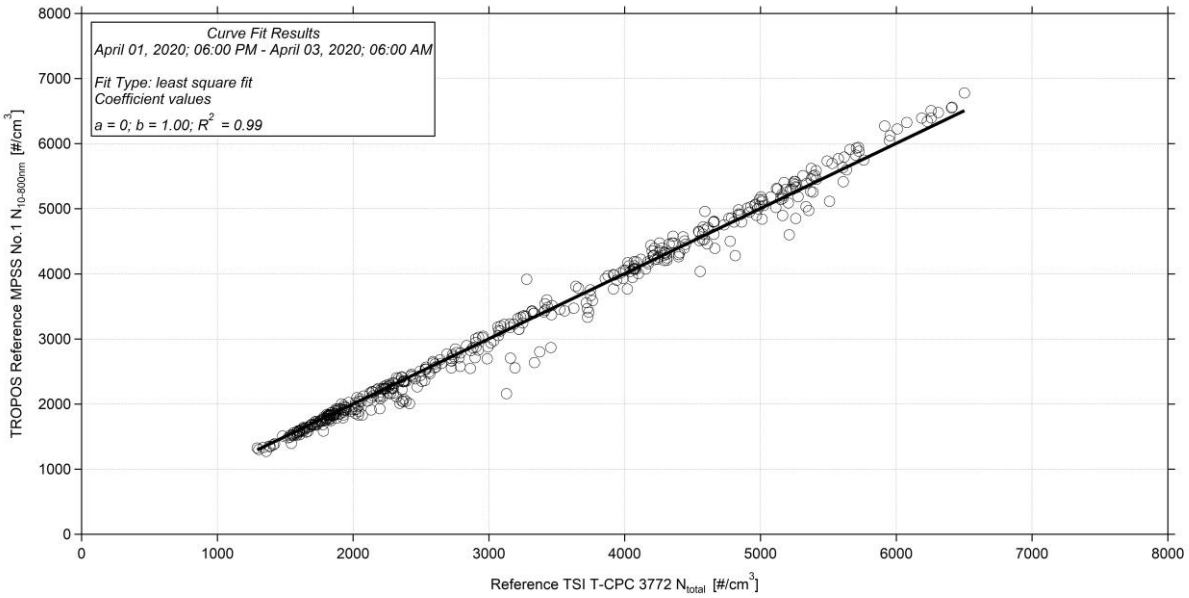

Figure 06: Linear regression between DE-TROPOS Reference T-CPC Model 3772 and DE-TROPOS reference instrument no.1.

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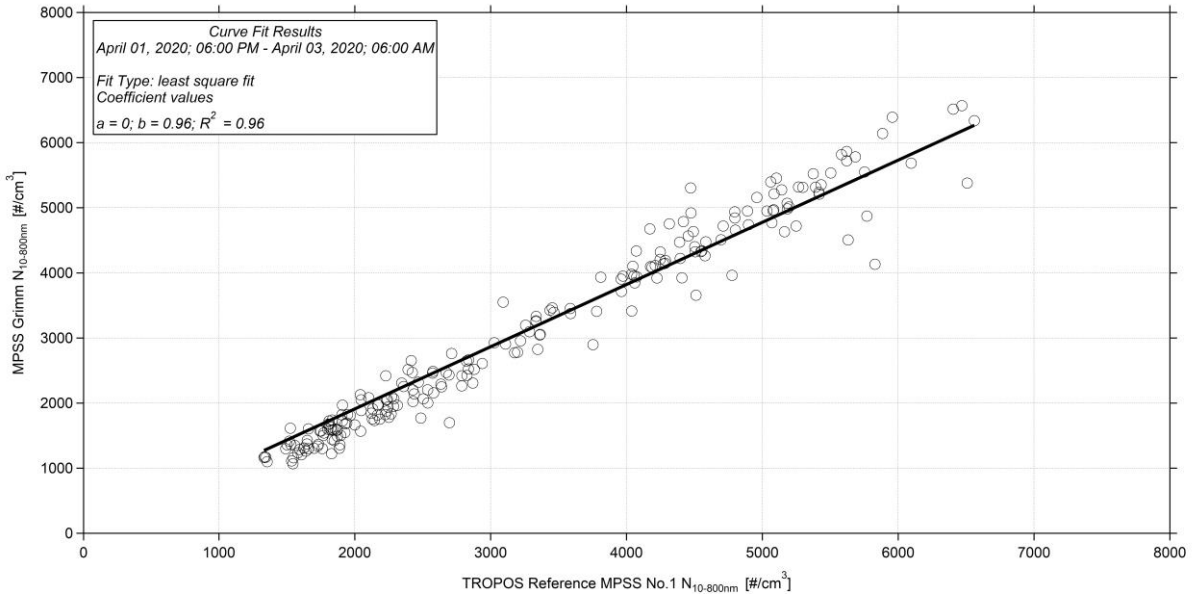

Figure 07: Linear regression between DE-TROPOS reference instrument no.1 and MPSS Grimm.

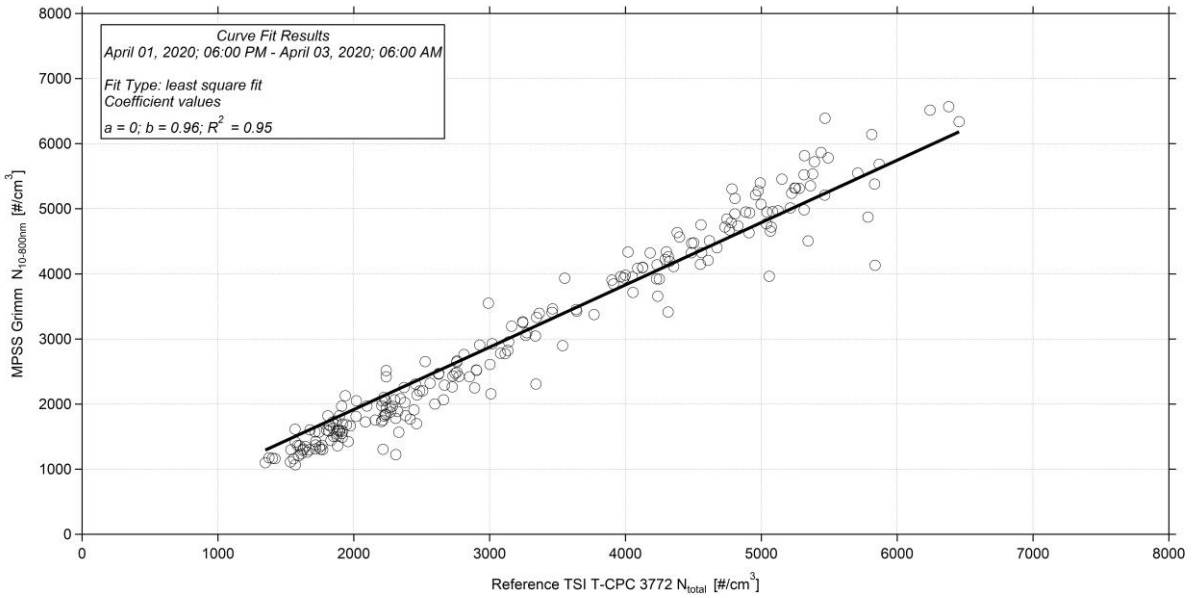

Figure 08: Linear regression between DE-TROPOS Reference T-CPC Model 3772 and MPSS Grimm.

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