



Leibniz Institute for  
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

## Intercomparison of Condensation Particle Counter

*Project No.:* CPC-2019-3-15

*Principal Investigator:* Andreas Massling

*Home Institution:* Department of Environmental Science  
Aarhus University  
Faculty of Science and Technology  
Denmark

*Participant:* –

*Candidate:* Denmark CPC  
*Counter (SN):* TSI CPC Model 3010 SN2407

*Location of the quality assurance:* TROPOS Leipzig, lab 130

*Comparison period:* July 12, 2019

*Last Intercomparison (with Project No.):*

*TROPOS Reference Instrument:* Electrometer: TSI model 3068B  
#70838596, Last calibration in September 2018

*Additional Equipment:* Bubble flow meter 'Gilibrator', Gilian (Sensidyne)  
#1711008-S, Last calibration in January 2018

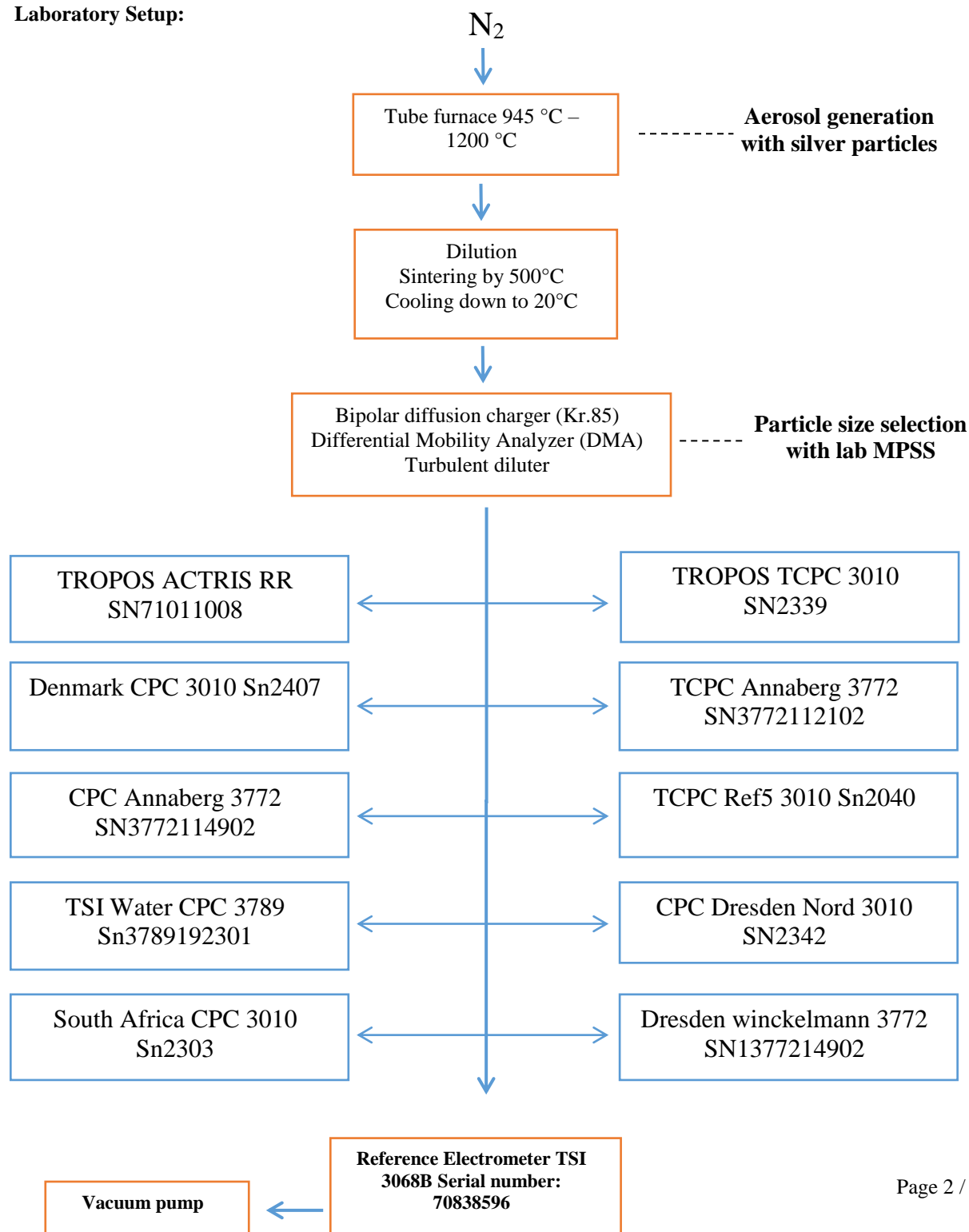
### Summary of Intercomparison

*Status:*

The candidate did not pass the quality standards of ACTRIS and GAW. The candidate reached 93% efficiency at 40 nm. The Dp50 is at 13.15 nm. The candidate has to be checked and cleaned again.

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### Laboratory Setup:





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**Date of arrival of instrument in calibration lab:**

*July 12, 2019*

**Instrument:**

*Condensation Particle Counter*

**Model and serial number of instrument:**

*CPC 3010 S/N 2407*

**Result of physical inspection:**

*no damages*

**Result of functional test:**

*functional test successful*

**Internal parameters of instrument**

*nominal flow rate 1.0 l/min*

**Model and identification number of  
aerosol electrometer:**

*TSI Electrometer Model 3068, S/N 70838596*

**Electrometer calibration certificate:**

*September 05, 2018, calibrated at PTB  
Braunschweig*

**Corrections of electrometer, for instance,  
differing flow rate:**

*Within tolerance range (+/-2%); reference: 4.0  
l/min, measured: 3.970 l/min*

**Software for recording:**

*LabView 2010; National Instruments; Program  
„LabCount.vi“*

**Date of calibration:**

*July 12, 2019*

**Lab temperature and pressure:**

*23°C, 996.08mbar*

**Measured aerosol flow rate of CPC:**

*0.987 l/min*

**Uncertainty in measured flow rate:**

*3%*

**Flowmeter used:**

*Gilian Gilibrator V; S/N 1711008-S,  
January, 2018*

**Particles and gases used for calibration:**

*silver particles and nitrogen*

**Method of particle generation:**

*tube furnace generator*

**Zero measurement of instrument:**

*0 particles/cm<sup>3</sup> in 5 minutes*

**Results (using pulse output):**

<b>Particle size (nm)</b>	<b>40</b>	<b>30</b>	<b>20</b>	<b>15</b>	<b>12</b>
Number concentration (cm-3)	1047	1427	1379	994	332
Counting efficiency $\eta$	0.93	0.91	0.85	0.63	0.31
<b>Particle size (nm)</b>	<b>10</b>	<b>09</b>	<b>08</b>	<b>07</b>	<b>06</b>
Number concentration (cm-3)	147	82	19	1	0
Counting efficiency $\eta$	0.11	0.05	0.01	0.00	0.00
<b>Particle size (nm)</b>	<b>40</b>				
Number concentration (cm-3)					
Counting efficiency $\eta$					

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### Special Information regarding to the Candidate:

Was it necessary to:	yes/no	information
do a second run	no	-
clean the optics	no	-
clean the nozzle	no	-
clean the saturator	no	-
change the wick	no	-
change the laser	no	-
change internal settings	no	-

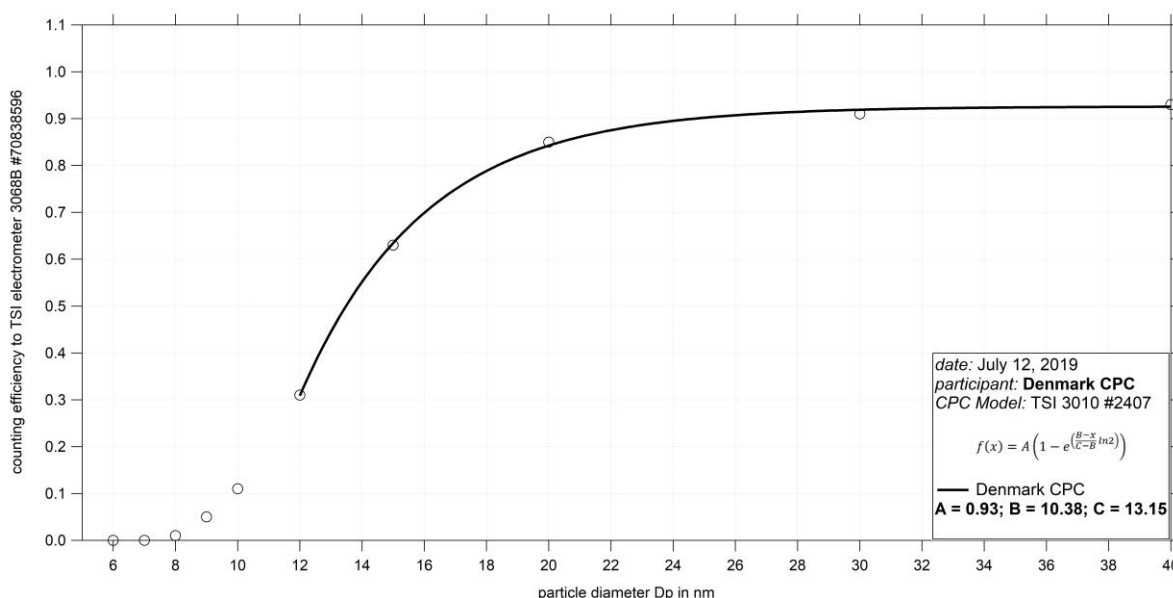


Fig. 1: Counting efficiency for Denmark CPC 3010 SN2407 against aerosol electrometer 3068 SN 70838596; silver particles between 6 and 40 nm were used for calibration; the calculated  $D_{p50}$  is 13.15 nm.

### Status information:

Status	T SAT	T CON	T OPT	T CAB	P AMB
from display	-	-	-	-	-
Status	P OR	P NO	Laser	LV	flow
from display	-	-	-	full	0.987

Date of issue: July 12, 2019

Reviewed: TROPOS / Kay Weinhold

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