



Leibniz Institute for  
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

## Intercomparison of Condensation Particle Counter

*Project No.:* CPC-2019-4-2

*Principal Investigator:* Jean-François Doussin

*Home Institution:* CNRS IRCELYON

*Participant:* Sebastien Perrier  
Clement Dubois

*Candidate:* IRCELYON  
*Counter (SN):* TSI CPC Model 3776 #70931081

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

*Comparison period:* September 17, 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 showed approximately 30% higher concentration at the plateau of 40nm against the reference electrometer. Using silver particles to select smaller particles, the candidate overestimated even more. TROPOS checked the flow and cleaned the parts of the TSI CPC. The candidate reached 99% efficiency at 40 nm. The CPC efficiency curve did not correspond to the standard of ACTRIS and GAW.

Page 1 / 4

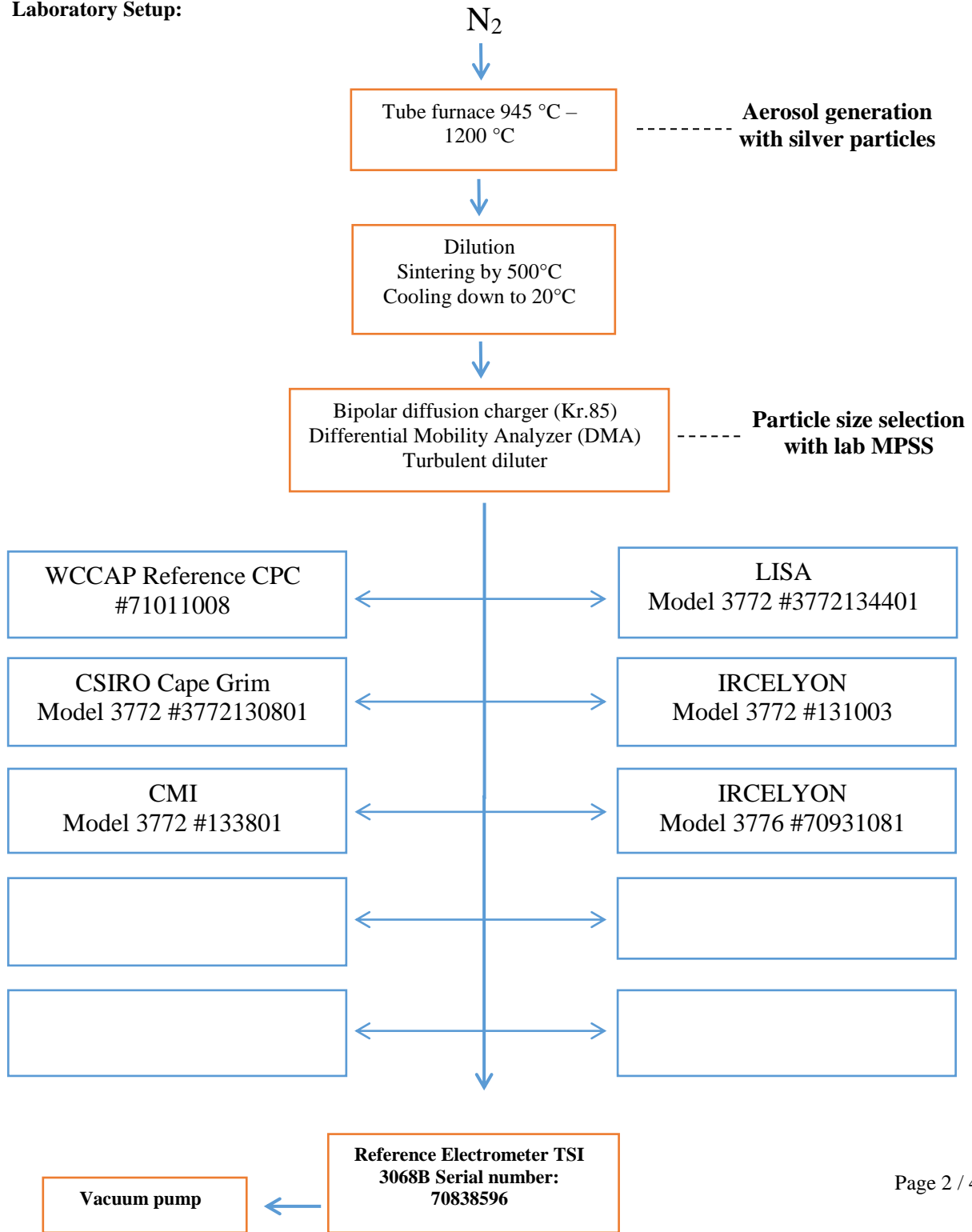
Leibniz-Institut für Troposphärenforschung e.V.  
Telefon: +49 341 2717-7060  
Telefax: +49 341 2717-99-7060  
info@tropos.de  
<http://www.tropos.de>

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

Mitglied der  
  
Leibniz-Gemeinschaft

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

**Laboratory Setup:**





Leibniz Institute for  
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

**Date of arrival of instrument in calibration lab:** *September 17, 2019*  
**Instrument:** *Condensation Particle Counter*  
**Model and serial number of instrument:** *CPC 3776 S/N 70931081*

**Result of physical inspection:** *no damages*  
**Result of functional test:** *cleaned, factor 2 in the concentration*

**Internal parameters of instrument** *nominal flow rate 1.5 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: 4.00 l/min*

**Software for recording:** *LabView 2010; National Instruments; Program „LabCount.vi“*

**Date of calibration:** *September 17, 2019*  
**Lab temperature and pressure:** *23°C, 1001 mbar*  
**Measured aerosol flow rate of CPC:** *1.416 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):**

Particle size (nm)	40	30	20	15	12
Number concentration (cm-3)	1539	2278	2537	1553	2602
Counting efficiency $\eta$	1.32	1.42	1.46	1.47	1.52
Particle size (nm)	10	09	08	07	06
Number concentration (cm-3)	1617	2405	3540	3789	3708
Counting efficiency $\eta$	1.54	1.57	1.58	1.59	1.61
Particle size (nm)					
Number concentration (cm-3)					
Counting efficiency $\eta$					

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

**Special Information regarding to the Candidate:**

Was it necessary to:	yes/no	information
do a second run	yes	After cleaning and checking settings and flow adjustment
clean the optics	yes	-
clean the nozzle	yes	-
clean the saturator	yes	It was necessary to clean
change the wick	yes	Changed to TROPOS wick
change the laser	no	-
change internal settings	no	Adjust flow

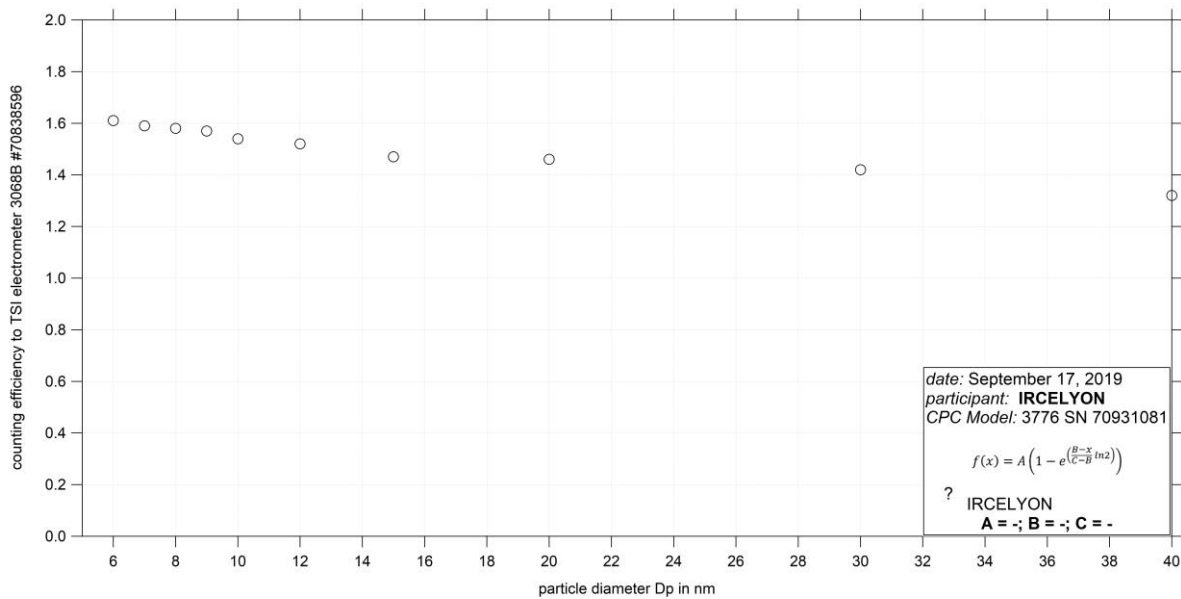


Fig. 1: Counting efficiency for TSI CPC Model 3776 #70931081 against aerosol electrometer 3068 S/N 70838596; silver particles between 6 and 40 nm were used for calibration.

**Status information:**

<b>Status</b>	<b>T SAT</b>	<b>T CON</b>	<b>T OPT</b>	<b>T CAB</b>	<b>P AMB</b>
from display	39	10	40	32.5	99.1
<b>Status</b>	<b>P OR</b>	<b>P NO</b>	<b>Laser</b>	<b>LV</b>	<b>flow</b>
from display	60.0	3.22	24	full	1.416

**Date of issue:** September 17, 2019

Reviewed: TROPOS / Kay Weinhold

Page 4 / 4