



Leibniz Institute for
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

Intercomparison of Condensation Particle Counter

Project No.: CPC-2019-4-3

Principal Investigator: Jean-François Doussin

Home Institution: CNRS IRCELYON

Participant: Sebastien Perrier
Clement Dubois

Candidate: IRCELYON
Counter (SN): TSI CPC Model 3772 #131003

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 passed the quality standards of ACTRIS and GAW. The candidate reached 100% efficiency at 40 nm. The Dp50 is at 9.38 nm in the final-status. The CPC efficiency curve corresponds to the standard of ACTRIS and GAW.

Info: The candidate passed the pre-status. To increase the performance, TROPOS opened the CPC and checked and cleaned it. It was not necessary to replace or repair anything.

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

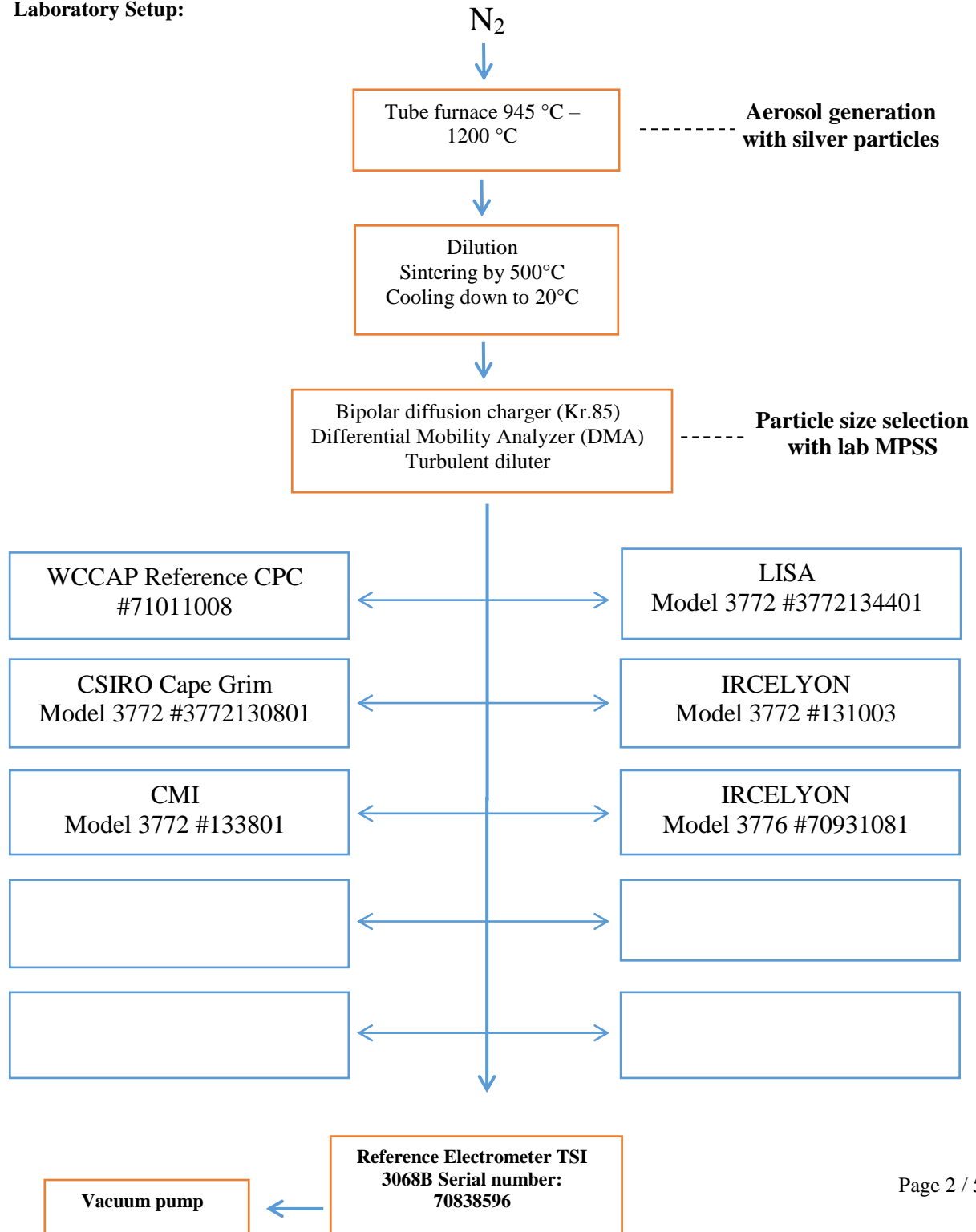
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Laboratory Setup:





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Date of arrival of instrument in calibration lab: *September 17, 2019*
Instrument: *Condensation Particle Counter*
Model and serial number of instrument: *CPC 3772 S/N 131003*

Result of physical inspection: *no damages*
Result of functional test: *cleaned*

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: 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, 1004 mbar*
Measured aerosol flow rate of CPC: *pre-status: 0.989 l/min, final status: 1.024 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/cm³ in 5 minutes*

Special Information regarding to the Candidate:

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

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Results (using pulse output): pre-status

Particle size (nm)	40	30	20	15	12
Number concentration (cm ⁻³)	1142	1562	1640	918	1292
Counting efficiency η	0.98	0.97	0.94	0.87	0.75
Particle size (nm)	10	09	08	07	06
Number concentration (cm ⁻³)	625	690	571	142	1
Counting efficiency η	0.60	0.45	0.25	0.06	0.0
Particle size (nm)					
Number concentration (cm ⁻³)					
Counting efficiency η					

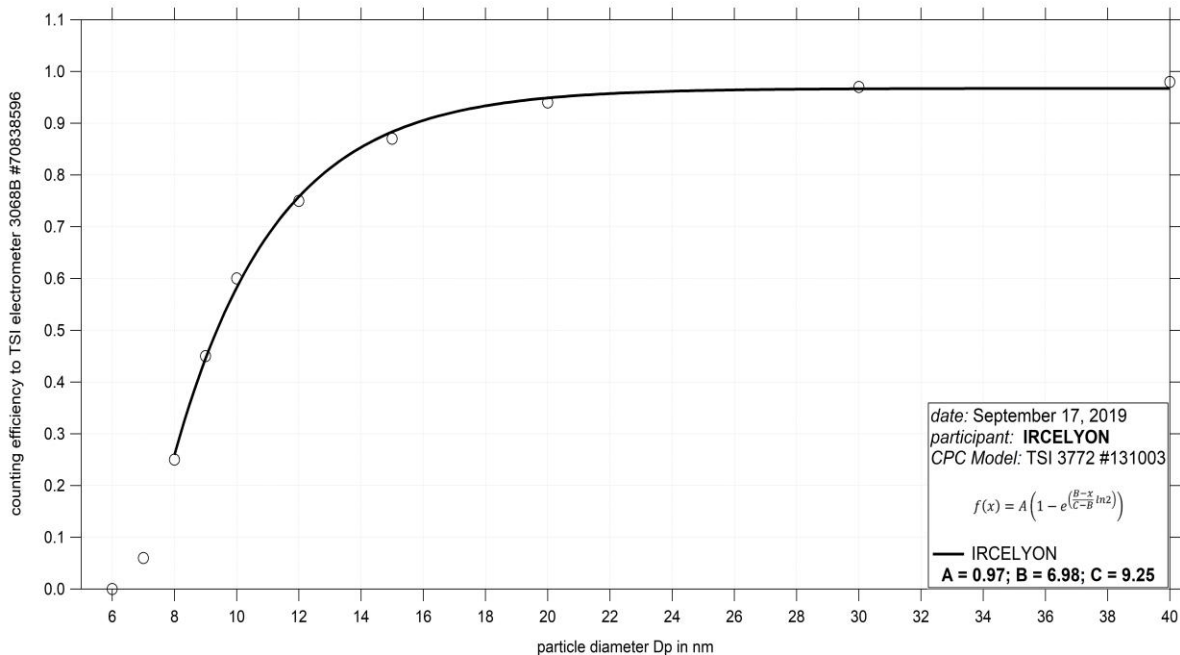


Fig. 1: pre-status: Counting efficiency for TSI CPC Model 3772 #131003 against aerosol electrometer 3068 S/N 70838596; silver particles between 6 and 40 nm were used for calibration; the calculated D_{p50} is 9.25 nm.

Status information:

Status	T SAT	T CON	T OPT	T CAB	P AMB
from display	39	22	40	32.6	99.8
Status	P OR	P NO	Laser	LV	flow
from display	81.4	2.7	29	full	0.989

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Results (using pulse output): final-status

Particle size (nm)	40	30	20	15	12
Number concentration (cm ⁻³)	932	-	1464	-	-
Counting efficiency η	1.01	-	1.00	-	-
Particle size (nm)	10	09	08	07	06
Number concentration (cm ⁻³)	848	-	522	-	1
Counting efficiency η	0.59	-	0.25	-	0.00
Particle size (nm)					
Number concentration (cm ⁻³)					
Counting efficiency η					

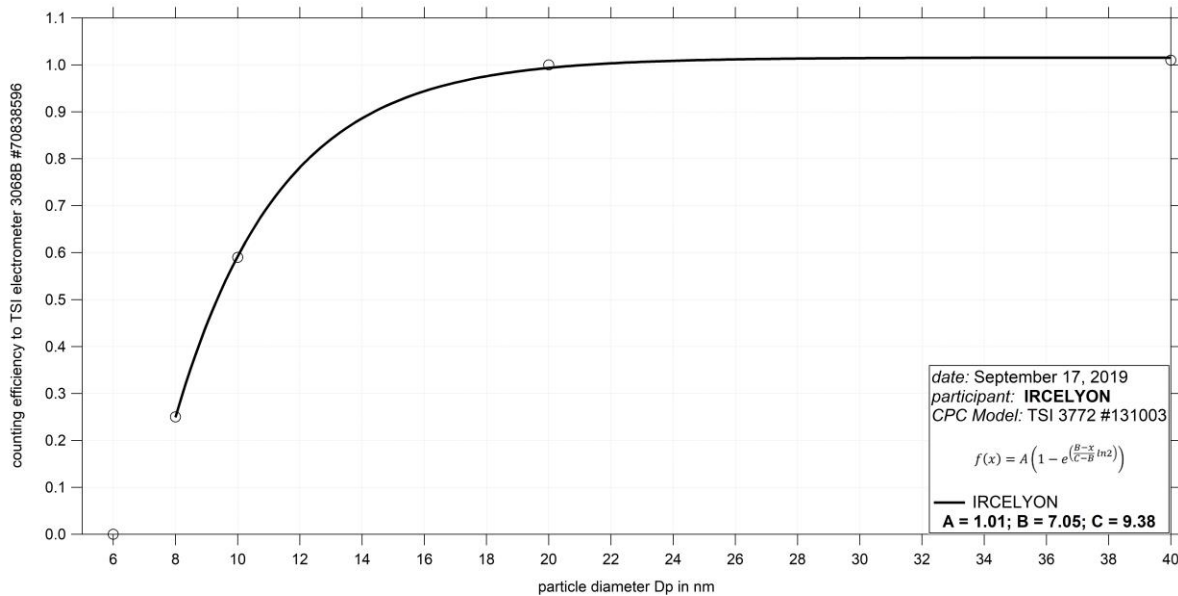


Fig. 1: final-status: Counting efficiency for TSI CPC Model 3772 #131003 against aerosol electrometer 3068 S/N 70838596; silver particles between 6 and 40 nm were used for calibration; the calculated Dp_{50} is 9.38 nm.

Status information:

Status	T SAT	T CON	T OPT	T CAB	P AMB
from display	39	22	40	32.6	99.8
Status	P OR	P NO	Laser	LV	flow
from display	81.4	2.6	29	full	1.024

Date of issue: September 17, 2019

Reviewed: TROPOS / Kay Weinhold