



Leibniz Institute for
Tropospheric Research

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig

Intercomparison of Condensation Particle Counter

Project No.: CPC-2019-3-1

Principal Investigator: TROPOS

Home Institution: Danish Technological Institute

Participant: Søren Nielsen Skov
Candidate: UCPC DTI
Counter (SN): TSI CPC Model 3776 SN70701039

Location of the quality assurance: TROPOS Leipzig, lab 130

Comparison period: June 04, 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

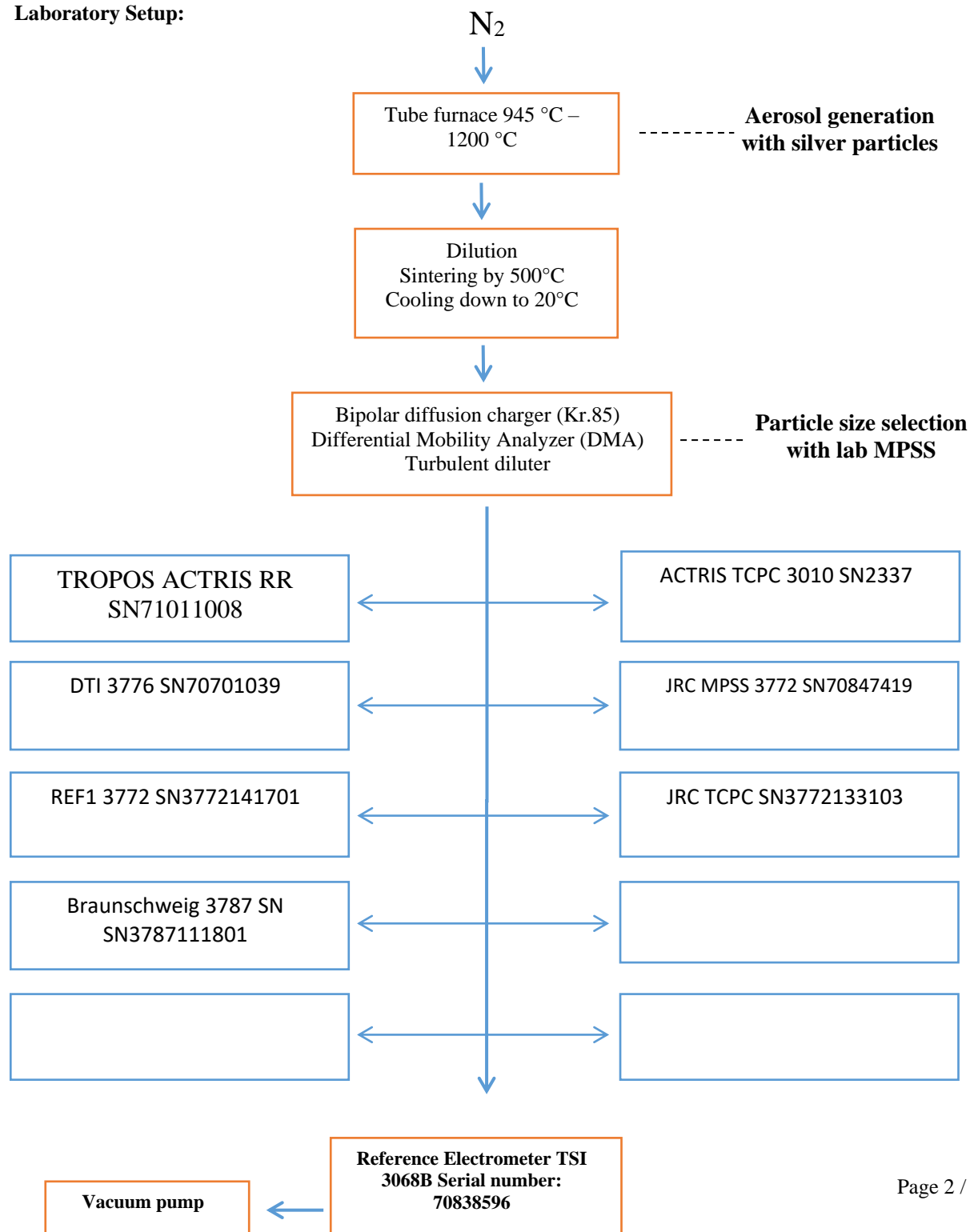
Status:

The candidate did not pass the quality standards of ACTRIS and GAW. The candidate needs a second run after cleaning and calibration the CPC.

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Laboratory Setup:





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Date of arrival of instrument in calibration lab:

June 04, 2019

Instrument:

Condensation Particle Counter

Model and serial number of instrument:

CPC 3776 S/N 71011008

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:

June 04, 2019

Lab temperature and pressure:

23°C, 983.82 mbar

Measured aerosol flow rate of CPC:

1.528 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

Results (using pulse output):

Particle size (nm)	40	30	20	15	12
Number concentration (cm-3)	1106	1013	1243	1205	1088
Counting efficiency η	0.95	0.97	0.99	1.01	1.04
Particle size (nm)	10	09	08	07	06
Number concentration (cm-3)	1579	1449	2265	2327	1543
Counting efficiency η	1.01	1.04	1.05	1.05	1.07
Particle size (nm)	05	40			
Number concentration (cm-3)	985	997			
Counting efficiency η	1.11	0.95			

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Special Information regarding to the Candidate:

Was it necessary to:	yes/no	information
do a second run	yes	CPC has to be cleaned
clean the optics	yes	-
clean the nozzle	yes	-
clean the saturator	yes	-
change the wick	yes	-
change the laser	yes	-
change internal settings	yes	Adjust the flow rate

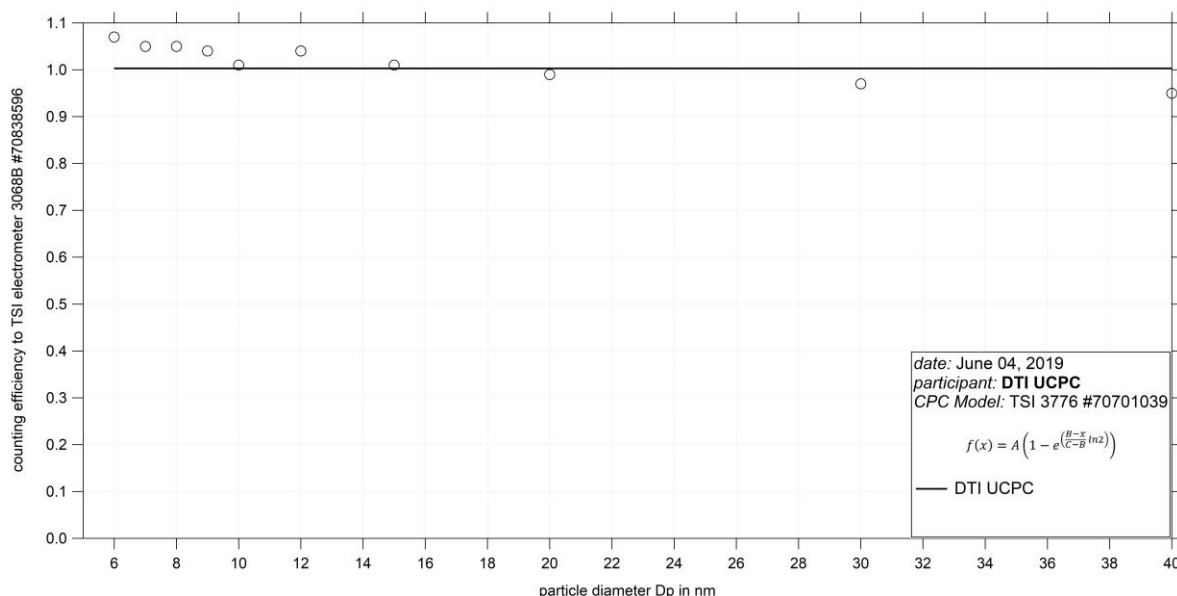


Fig. 1: Counting efficiency for DTI UCPC TSI 3776 SN SN70701039 against aerosol electrometer 3068 SN 70838596; silver particles between 6 and 40 nm were used for calibration; the calculated Dp_{50} is 8.03 nm.

Status information:

Status	T SAT	T CON	T OPT	T CAB	P AMB
from display	39.0	10	40.0	33.4	99.6
Status	P OR	P NO	Laser	LV	flow
from display	60.7	2.6	35	full	1.528

Date of issue: June 04, 2019

Reviewed: TROPOS / Kay Weinhold

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Principal Investigator: TROPOS

Home Institution: Danish Technological Institute

Participant: Søren Nielsen Skov
Candidate: UCPC DTI
Counter (SN): TSI CPC Model 3776 SN70701039

Location of the quality assurance: TROPOS Leipzig, lab 130

Comparison period: June 05, 2019

Last Intercomparison (with Project No.):

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

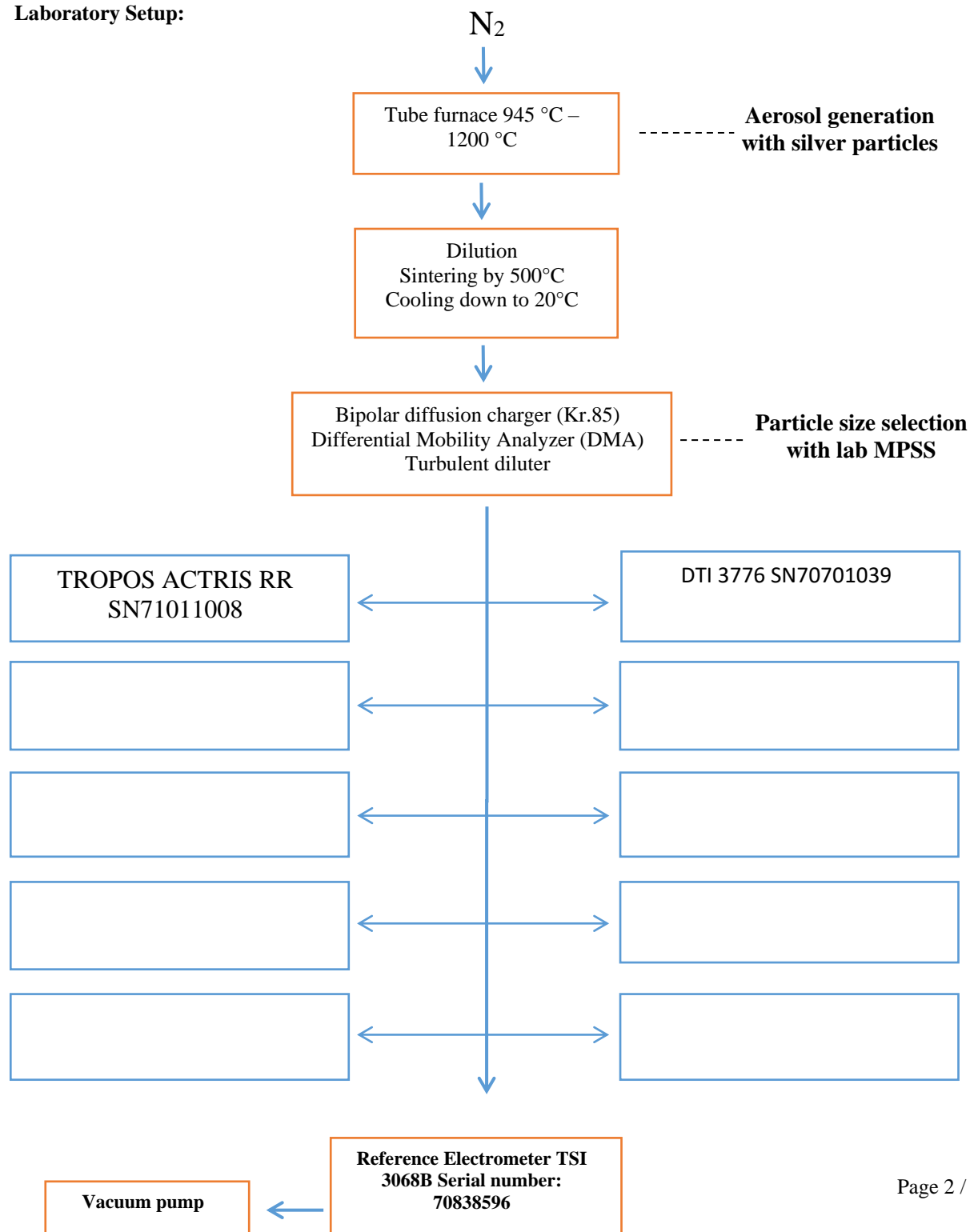
Additional Equipment: Bubble flow meter 'Gilibrator', Gilian (Sensidyne)
#1711008-S, Last calibration in January 2018

Summary of Intercomparison

Status second run:

The candidate passed the quality standards of ACTRIS and GAW. The candidate reached 100% efficiency at 40 nm. The Dp50 is at 4.82 nm. The CPC efficiency curve corresponds to the standard of ACTRIS and GAW.

Laboratory Setup:





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Date of arrival of instrument in calibration lab:

June 05, 2019

Instrument:

Condensation Particle Counter

Model and serial number of instrument:

CPC 3776 S/N 71011008

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:

June 05, 2019

Lab temperature and pressure:

23°C, 983.82 mbar

Measured aerosol flow rate of CPC:

1.528 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

Results (using pulse output):

Particle size (nm)	40	20	10	09	08
Number concentration (cm-3)	1050	882	867	1449	1030
Counting efficiency η	1.00	0.94	0.78	1.04	0.71
Particle size (nm)	05	40			
Number concentration (cm-3)	894	1184			
Counting efficiency η	0.51	1.02			

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Special Information regarding to the Candidate:

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

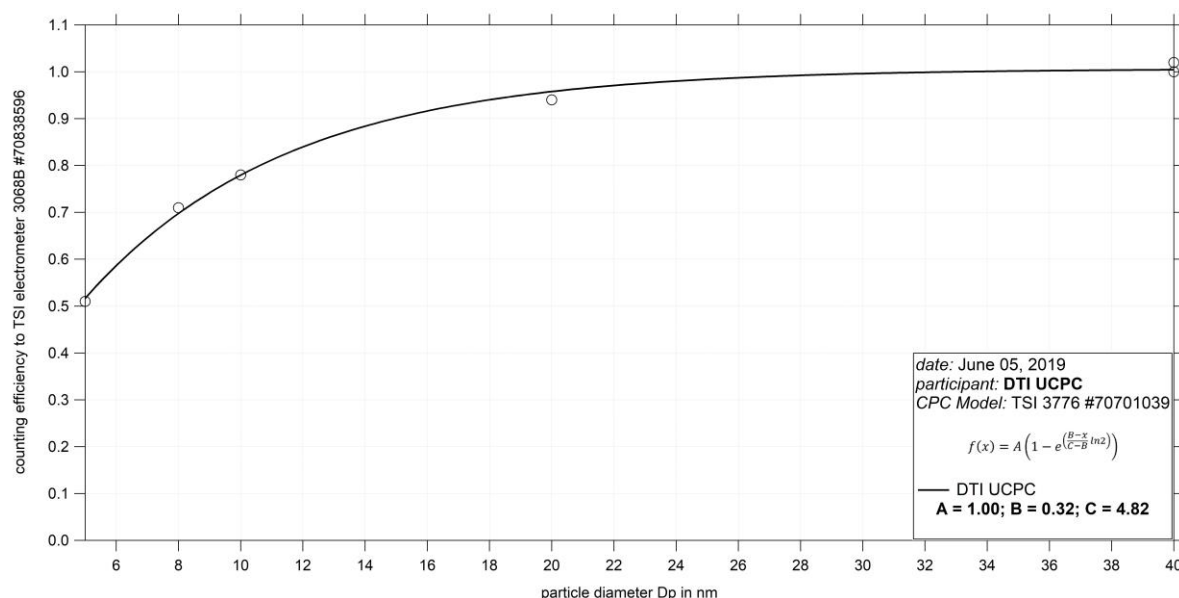


Fig. 1: Counting efficiency for DTI UCPC TSI 3776 SN SN70701039 against aerosol electrometer 3068 SN 70838596; silver particles between 5 and 40 nm were used for calibration; the calculated Dp_{50} is 4.82 nm.

Status information:

Status	T SAT	T CON	T OPT	T CAB	P AMB
from display	39.0	10	40.0	33.4	99.6
Status	P OR	P NO	Laser	LV	flow
from display	60.7	2.6	35	full	1.528

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