World Calibration Centre
for Aerosol Physics

TROPOS

Leibniz Institute for
Tropospheric Research

Project No.	CPC-2021-1-4b
CPC Model:	TSI CPC 3750
CPC Serial Number:	SN3750193502
Customer:	LANUV
Description:	Calibration of a Condensation Particle Counter
Date of Calibration:	November 10, 2021

Summary of Intercomparison:

The candidate did not the quality standards of ACTRIS and GAW. The candidate reached 94% efficiency at 40 nm. The Dp50 is at 6.76 nm.

Certificate / Reference: WCCAP

Date of issue:	November 10, 2021	Signature	
Reviewed by:	TROPOS	Name:	Dipl.-Met. Kay Weinhold

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Table 1. Diagnostic information of candidate

	Unit	Status
Participant		LANUV 3750 SN3750193502
CPC Model		TSI 3750
Firmware		2.3.0
Manufacture date		
Last service date		
Arrival date		
Software Version		
Saturator Temperature	°C	39
Condenser Temperature	°C	20
Optics Temperature	°C	40
Cabinet Temperature	°C	24.9
Ambient Pressure	mbar	101.1
Vaccuum Pressure	kPa	69.2
Inlet Pressure	kPa	0
Critical Orifice Pressure	kPa	66.7
Aerosol Nozzle Pressure	kPa	2.41
Laser Current	mA	43
Liquid Level		full
Aerosol Flow	L/min	0.99
Zero	avg 10 min	0
Physical inspection		ok
Functional test		ok

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Table 2. Calibration and laboratory conditions

	Information
Aerosol electrometer	TSI Electrometer Model 3068, SN 70838596
Particles and gases used for calibration	silver particles and nitrogen
Method of particle generation	tube furnace generator
Electrometer calibration certificate	September, 2021, calibrated at PTB Braunschweig
Corrections of electrometer (i.e. differing flow rate)	Within tolerance range (+/-2%); reference: 4.0 l/min, measured: 4.0 l/min
Logging software	LabView 2010; National Instruments; Program „LabCount.vi“
Uncertainty in measured flow rate	3%
Flowmeter used	Gilian Gilibrator 3; SN 21181001005, 2021
Lab Tempreature and Pressure	23.0°C, 1018 mbar

Table 2. Efficiency of candidate CPC per diameter against the Electrometer

Diameter	EL 3068B (#/cm³)	Pulse Output		Internal Output		Internal/ Pulse
		Concentration (#/cm³)	Efficiency (µ)	Concentration (#/cm³)	Efficiency (µ)	
40nm	1592	1511	0.95	1555	0.98	1.03
30nm_2	1369	1305	0.95	1332	0.97	1.02
30nm	1211	1147	0.95	1180	0.97	1.02
20nm	1216	1130	0.93	1157	0.95	1.02
14nm	1404	1220	0.87	1251	0.89	1.02
11nm	1228	969	0.79	993	0.81	1.03
10nm	1527	1131	0.74	1159	0.76	1.03
9nm	1575	1076	0.68	1104	0.70	1.03
8nm	1402	864	0.62	887	0.63	1.02
7nm	1704	880	0.52	899	0.53	1.02
6nm	1689	635	0.38	652	0.39	1.03
5nm	1216	199	0.16	204	0.17	1.06
4nm	438	7	0.02	7	0.02	1.00

Table 3. Linearity of candidate CPC against the Electrometer

EL 3068B (#/cm³)	Pulse Output		Internal Output		Internal/ Pulse
	Concentration (#/cm³)	Efficiency (µ)	Concentration (#/cm³)	Efficiency (µ)	
1959	1864	0.95	1912	0.98	1.03
4257	4022	0.94	4147	0.97	1.03
8350	7714	0.92	8054	0.96	1.04
12226	11171	0.91	11792	0.96	1.05
21100	18727	0.89	20343	0.96	1.08
28852	24590	0.85	27380	0.95	1.12
41999	34572	0.82	39993	0.95	1.16
48722	39520	0.81	46574	0.96	1.19
61953	48602	0.78	59494	0.96	1.23

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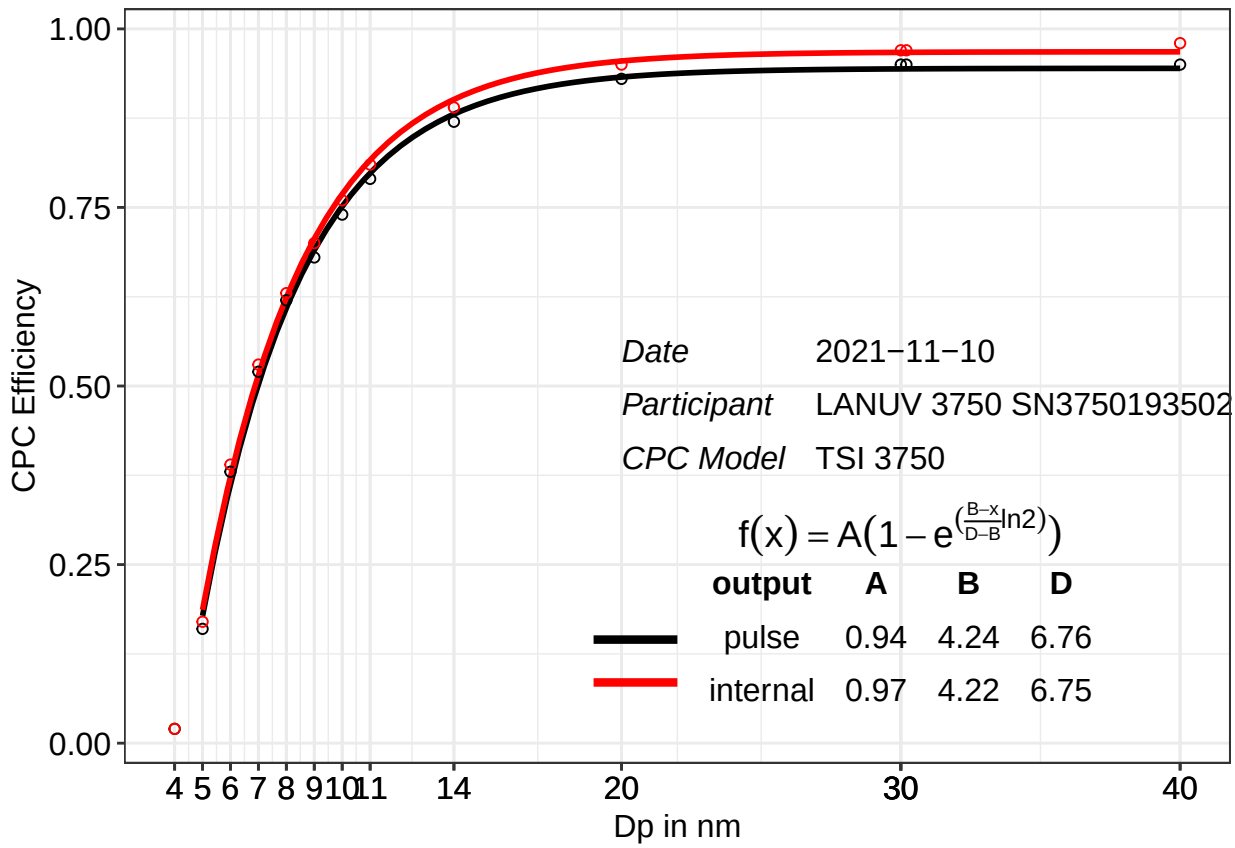

Fig. 1. Counting efficiency of candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles between 5 nm and 40 nm were used for calibration.

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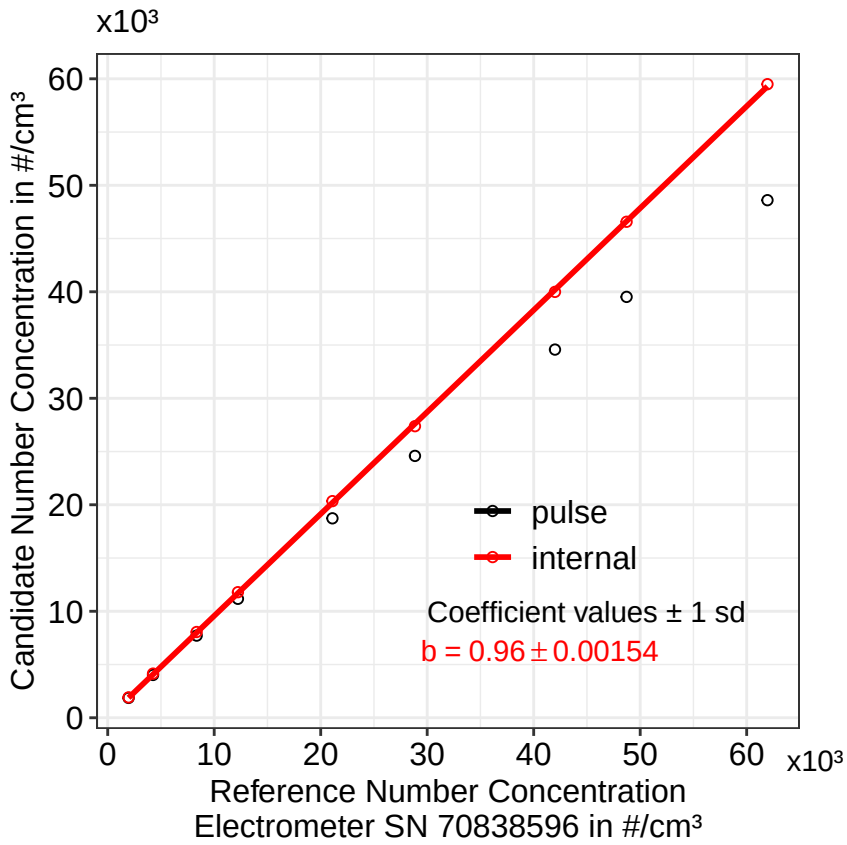

Fig. 2. Linearity for candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles with a diameter of 30 nm were used for number concentrations between 2000 particles per cm³ and 60000 particles per cm³.

Date of issue:	*November 10, 2021*
Reference:	TSI electrometer, model 3068, SN 70838596
Reviewed:	TROPOS/Kay Weinhold

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