



World Calibration Centre
for Aerosol Physics



Leibniz Institute for
Tropospheric Research

Project No. CPC-2021-1-7

CPC Model: TSI CPC 3750

CPC Serial Number: SN3750190506

Customer: HLNUG

Description: Calibration of a Condensation Particle Counter

Date of Calibration: November 10, 2021

Summary of Intercomparison:

The candidate did not pass the quality standards of ACTRIS and GAW. The candidate reached 93% efficiency at 40 nm. The Dp50 is at 5.77 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		HLNUG 3750 SN3750190506
CPC Model		TSI 3750
Firmware		2.3.0
Manufacture date		
Last service date		
Arrival date		
Software Version		
Saturator Temperature	°C	39
Condenser Temperature	°C	18
Optics Temperature	°C	40
Cabinet Temperature	°C	25
Ambient Pressure	mbar	101.1
Vacuum Pressure	kPa	69.5
Inlet Pressure	kPa	0.1
Critical Orifice Pressure	kPa	67
Aerosol Nozzle Pressure	kPa	2.56
Laser Current	mA	44
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 Temperature and Pressure	23.0°C, 1018 mbar



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

Diameter	EL 3068B (#/cm ³)	Pulse Output		Internal Output		Internal/ Pulse
		Concentration (#/cm ³)	Efficiency (μ)	Concentration (#/cm ³)	Efficiency (μ)	
40nm	1592	1495	0.94	1621	1.02	1.09
30nm_2	1369	1295	0.95	1395	1.02	1.07
30nm	1211	1133	0.94	1228	1.01	1.07
20nm	1216	1112	0.91	1201	0.99	1.09
14nm	1404	1224	0.87	1324	0.94	1.08
11nm	1228	1006	0.82	1086	0.88	1.07
10nm	1527	1198	0.78	1295	0.85	1.09
9nm	1575	1169	0.74	1265	0.80	1.08
8nm	1402	985	0.70	1066	0.76	1.09
7nm	1704	1070	0.63	1153	0.68	1.08
6nm	1689	875	0.52	946	0.56	1.08
5nm	1216	419	0.34	452	0.37	1.09
4nm	438	52	0.12	56	0.13	1.08

Table 3. Linearity of candidate CPC against the Electrometer

EL 3068B (#/cm ³)	Pulse Output		Internal Output		Internal/ Pulse
	Concentration (#/cm ³)	Efficiency (μ)	Concentration (#/cm ³)	Efficiency (μ)	
1959	1849	0.94	1999	1.02	1.09
4257	3985	0.94	4337	1.02	1.09
8350	7638	0.91	8429	1.01	1.11
12226	11057	0.90	12345	1.01	1.12
21100	18522	0.88	21212	1.01	1.15
28852	24287	0.84	28558	0.99	1.18
41999	33964	0.81	41591	0.99	1.22
48722	38678	0.79	48208	0.99	1.25
61953	47117	0.76	60570	0.98	1.29



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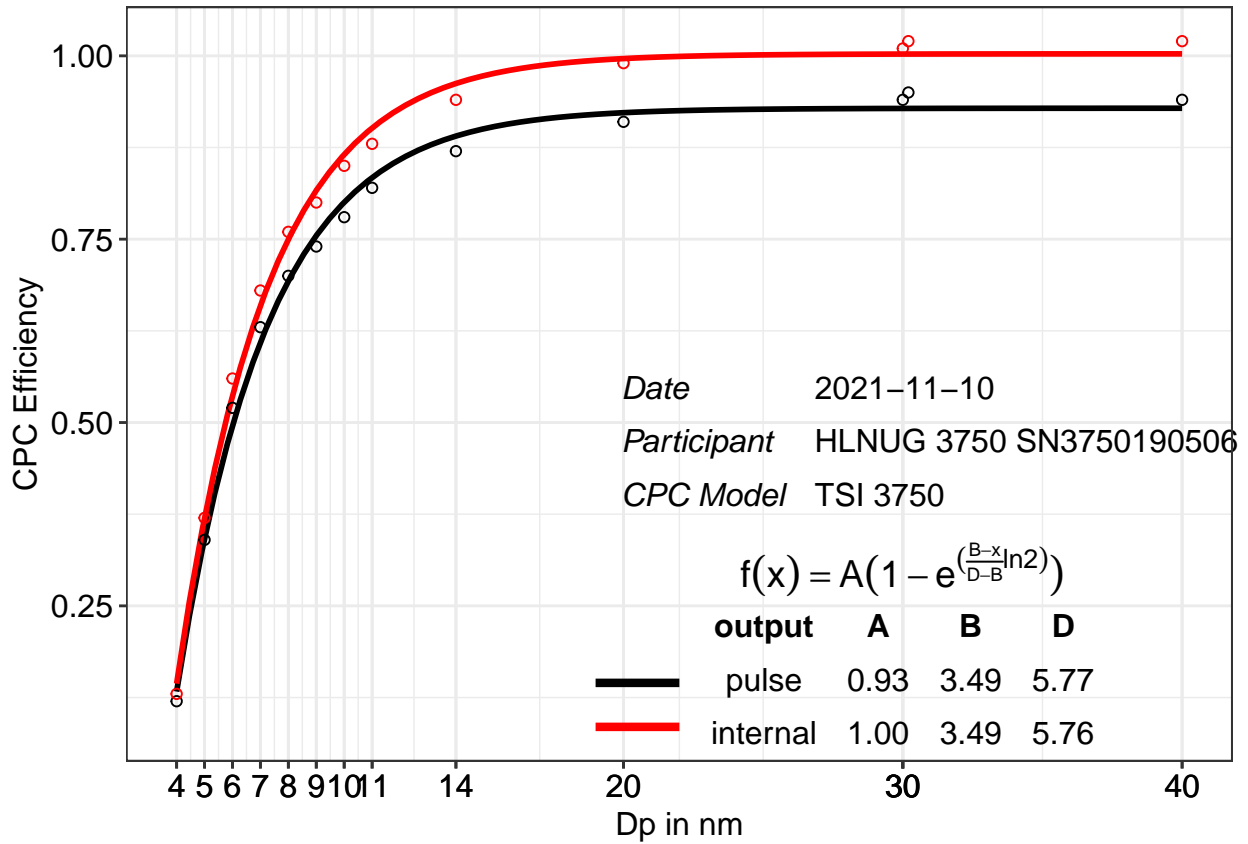


Fig. 1. Counting efficiency of candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles between 5 nm and 40 nm were used for calibration.



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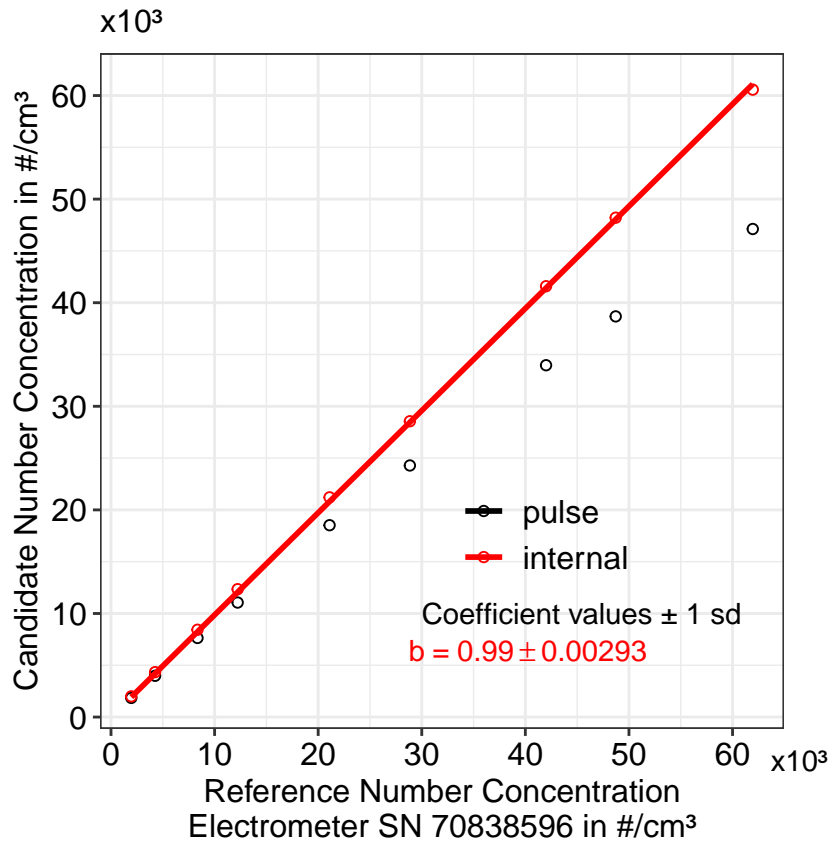


Fig. 2. Linearity for candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles with a diameter of 30 nm were used for number concentrations between 2000 particles per cm^3 and 60000 particles per cm^3 .

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