



World Calibration Centre
for Aerosol Physics



Leibniz Institute for
Tropospheric Research

Project No. CPC-2021-1-6

CPC Model: TSI CPC 3750

CPC Serial Number: SN3750190602

Customer: HLNUG

Description: Calibration of a Condensation Particle Counter

Date of Calibration: November 9, 2021

Summary of Intercomparison:

The candidate did not pass the quality standards of ACTRIS and GAW. The candidate reached 95% efficiency at 40 nm. The Dp50 is at 5.37 nm.

Certificate / Reference: WCCAP

Date of issue: November 9, 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 SN3750190602
CPC Model		TSI 3750
Firmware		2.3.0
Manufacture date		
Last service date		2019-02-20
Arrival date		2021-11-08
Software Version		
Saturator Temperature	°C	39
Condenser Temperature	°C	18
Optics Temperature	°C	40
Cabinet Temperature	°C	24.4
Ambient Pressure	mbar	101.5
Vacuum Pressure	kPa	73.6
Inlet Pressure	kPa	0.1
Critical Orifice Pressure	kPa	70.8
Aerosol Nozzle Pressure	kPa	2.89
Laser Current	mA	45
Liquid Level		full
Aerosol Flow	L/min	0.97
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	1600	1515	0.95	1530	0.96	1.01
30nm_2	1810	1735	0.96	1752	0.97	1.01
30nm	1686	1607	0.95	1615	0.96	1.01
20nm	1795	1696	0.94	1708	0.95	1.01
14nm	1342	1225	0.91	1225	0.91	1.00
11nm	1106	945	0.85	946	0.86	1.01
10nm	1859	1537	0.83	1547	0.83	1.00
9nm	1865	1473	0.79	1480	0.79	1.00
8nm	1312	972	0.74	975	0.74	1.00
7nm	1966	1327	0.67	1334	0.68	1.01
6nm	2019	1161	0.58	1168	0.58	1.00
5nm	1168	467	0.40	467	0.40	1.00

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)	
1795	1714	0.96	1728	0.96	1.00
3927	3741	0.95	3799	0.97	1.02
8151	7633	0.94	7864	0.96	1.02
11882	11066	0.93	11422	0.96	1.03
19302	17411	0.90	18425	0.95	1.06
29609	25895	0.87	28271	0.95	1.09
41593	35056	0.84	39664	0.95	1.13
52573	42580	0.81	49719	0.95	1.17
61939	49032	0.79	58254	0.94	1.19



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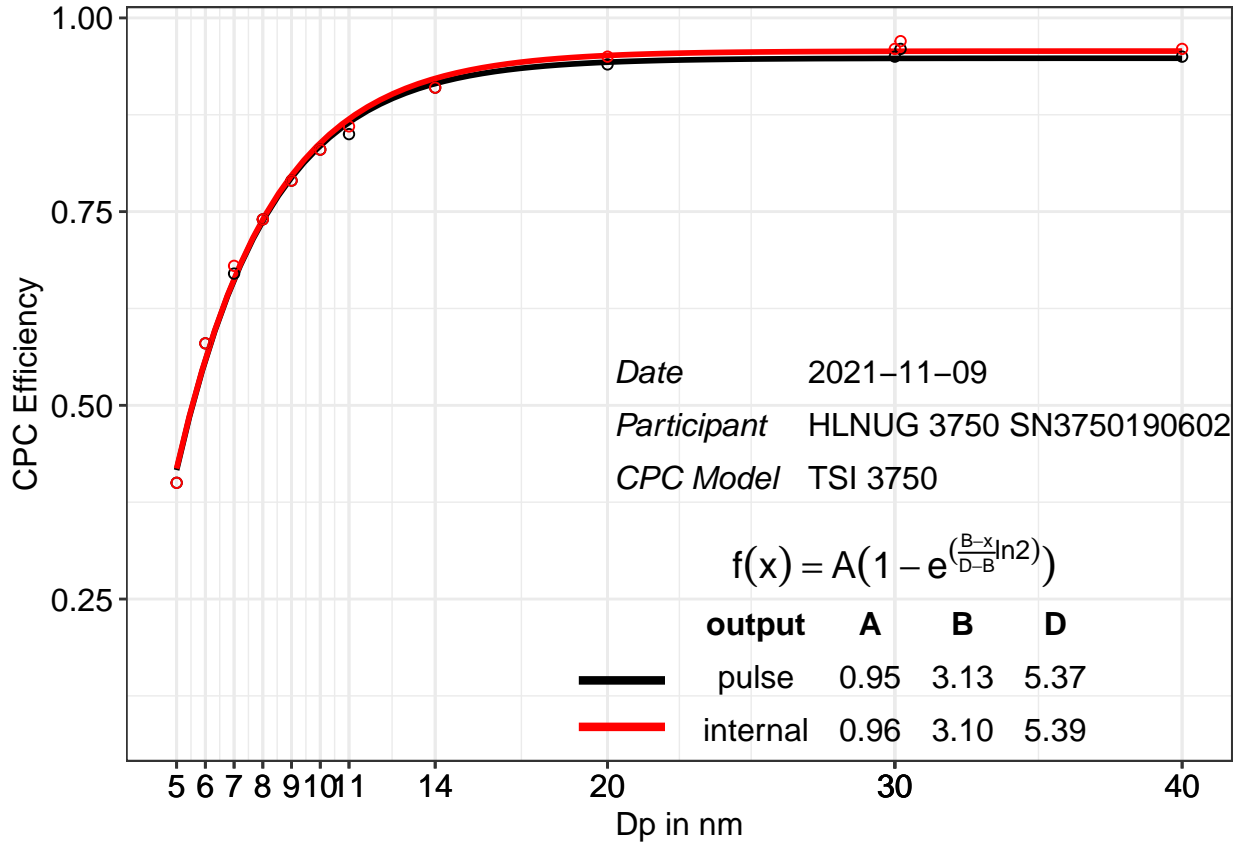


Fig. 1. Counting efficiency of candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles between 5 nm and 40 nm were used for calibration.



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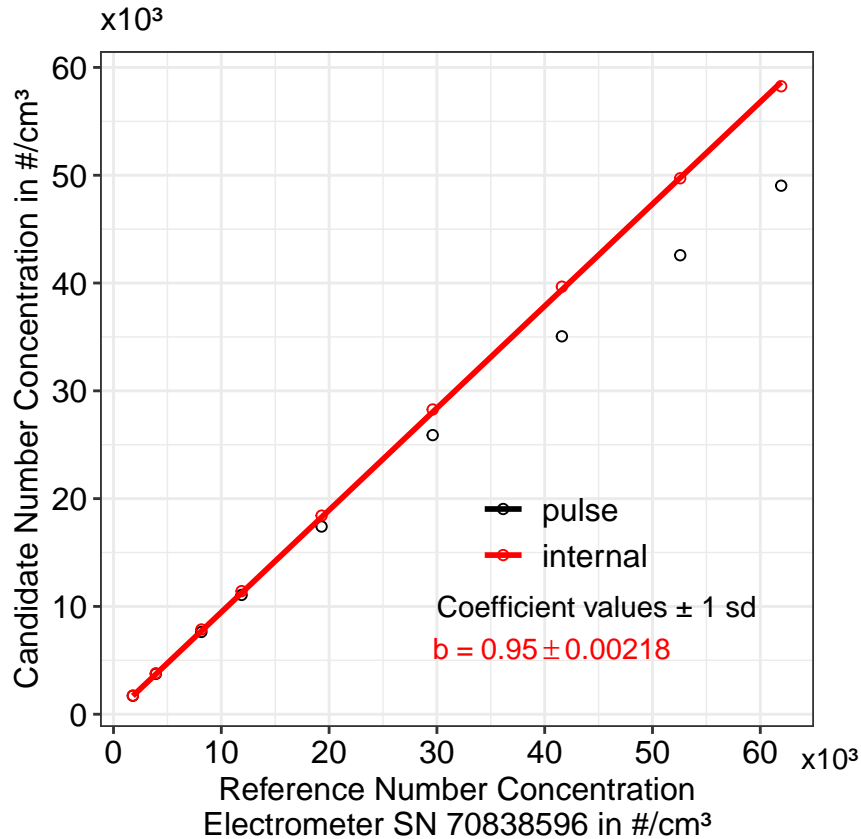


Fig. 2. Linearity for candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles with a diameter of 30 nm were used for number concentrations between 2000 particles per cm^3 and 60000 particles per cm^3 .

Date of issue: *November 9, 2021*
Reference: TSI electrometer, model 3068, SN 70838596
Reviewed: TROPOS/Kay Weinhold
