



World Calibration Centre  
for Aerosol Physics



Leibniz Institute for  
Tropospheric Research

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**Project No.** CPC-2021-1-4a

**CPC Model:** TSI CPC 3750

**CPC Serial Number:** SN3750193502

**Customer:** LANUV

**Description:** Calibration of a Condensation Particle Counter

**Date of Calibration:** November 9, 2021

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### Summary of Intercomparison:

The candidate passed the quality standards of ACTRIS and GAW. The candidate reached 100% efficiency at 40 nm. The Dp50 is at 5.1 nm. The CPC efficiency curve corresponds to the standard of ACTRIS and GAW.

Certificate / Reference: WCCAP

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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		LANUV 3750 SN3750193502
CPC Model		TSI 3750
Firmware		2.3.0
Manufacture date		
Last service date		2019-09-05
Arrival date		2021-11-08
Software Version		
Saturator Temperature	°C	39
Condenser Temperature	°C	18
Optics Temperature	°C	40
Cabinet Temperature	°C	24.7
Ambient Pressure	mbar	101.5
Vacuum Pressure	kPa	72.1
Inlet Pressure	kPa	-0.4
Critical Orifice Pressure	kPa	69.4
Aerosol Nozzle Pressure	kPa	2.41
Laser Current	mA	43
Liquid Level		full
Aerosol Flow	L/min	0.98
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 <sup>3</sup> )	Pulse Output		Internal Output		Internal/ Pulse
		Concentration (#/cm <sup>3</sup> )	Efficiency ( $\mu$ )	Concentration (#/cm <sup>3</sup> )	Efficiency ( $\mu$ )	
40nm	1600	1570	0.98	1607	1.00	1.02
30nm_2	1810	1806	1.00	1846	1.02	1.02
30nm	1686	1684	1.00	1715	1.02	1.02
20nm	1795	1825	1.02	1859	1.04	1.02
14nm	1342	1363	1.02	1380	1.03	1.01
11nm	1106	1087	0.98	1103	1.00	1.02
10nm	1859	1789	0.96	1823	0.98	1.02
9nm	1865	1740	0.93	1772	0.95	1.02
8nm	1312	1170	0.89	1190	0.91	1.02
7nm	1966	1619	0.82	1650	0.84	1.02
6nm	2019	1420	0.70	1447	0.72	1.03
5nm	1168	552	0.47	558	0.48	1.02

Table 3. Linearity of candidate CPC against the Electrometer

EL 3068B (#/cm <sup>3</sup> )	Pulse Output		Internal Output		Internal/ Pulse
	Concentration (#/cm <sup>3</sup> )	Efficiency ( $\mu$ )	Concentration (#/cm <sup>3</sup> )	Efficiency ( $\mu$ )	
1795	1786	1.00	1822	1.02	1.02
3927	3893	0.99	4001	1.02	1.03
8151	7946	0.97	8292	1.02	1.05
11882	11509	0.97	12033	1.01	1.04
19302	18089	0.94	19424	1.01	1.07
29609	26922	0.91	30058	1.02	1.12
41593	36542	0.88	42510	1.02	1.16
52573	44582	0.85	53948	1.03	1.21
61939	51526	0.83	64138	1.04	1.25



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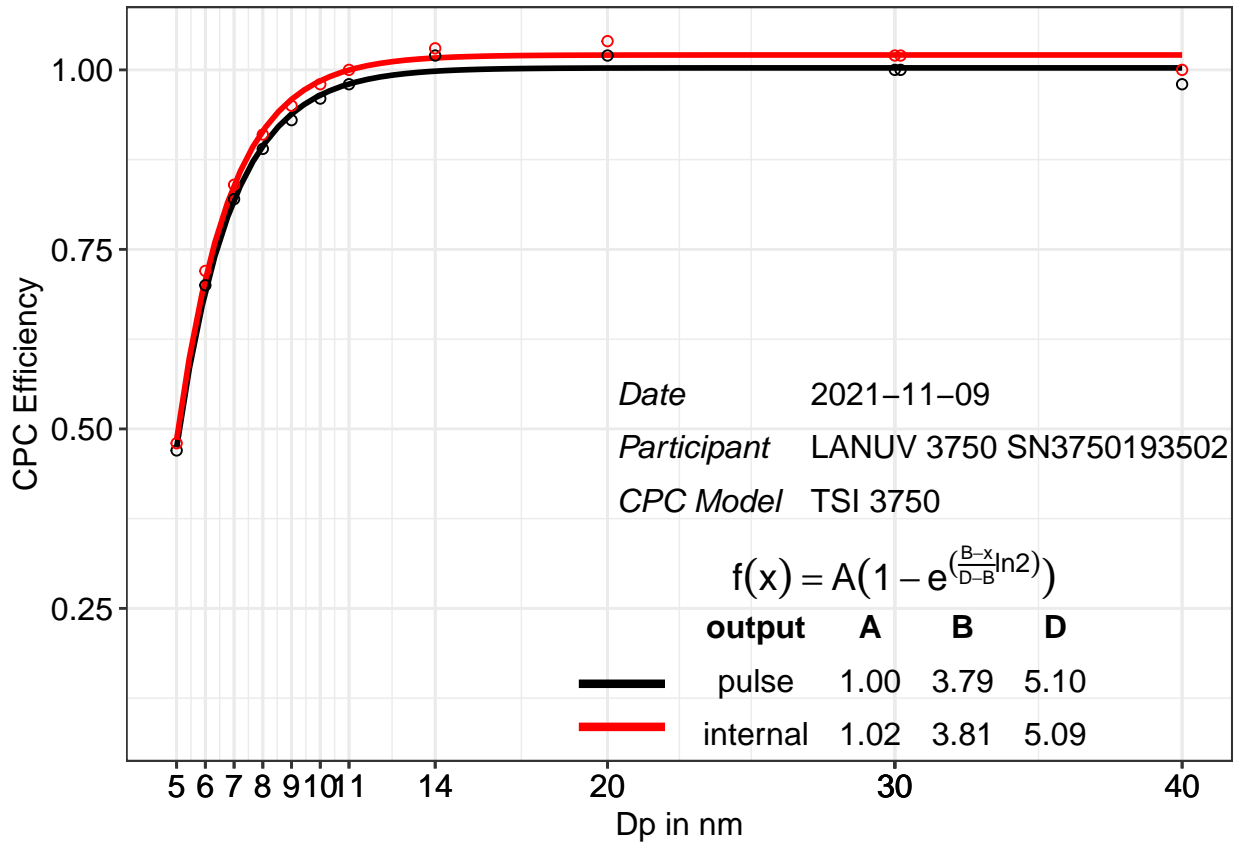


Fig. 1. Counting efficiency of candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles between 5 nm and 40 nm were used for calibration.



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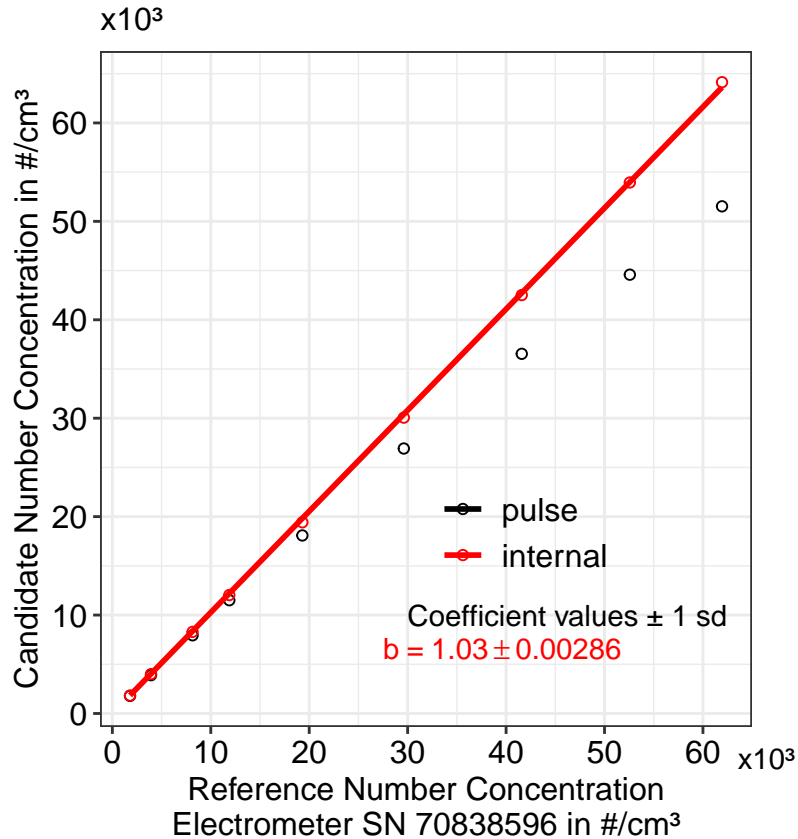


Fig. 2. Linearity for candidate CPC against aerosol electrometer 3068 SN 70838596; silver particles with a diameter of 30 nm were used for number concentrations between 2000 particles per  $cm^3$  and 60000 particles per  $cm^3$ .

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

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