



**World Calibration Centre
for Aerosol Physics**

Leibniz-Institut für Troposphärenforschung Permoserstraße 15 04318 Leipzig



**Leibniz Institute for
Tropospheric Research**

CPC Model: GRIMM WRAS2 CPC

CPC Serial Number: 54201607

Customer: Berlin-Airport

Description: Calibration of a Condensation Particle Counter (CPC, Model GRIMM WRAS2)

Date of Calibration: February 13, 2020

Certificate / Reference: WCCAP

Date of issue: February 13, 2020

Signature:

Reviewed by: **TROPOS**

Name: **Kay Weinhold**

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Date of arrival of instrument in calibration lab: *February 13, 2020*
Instrument: *Condensation Particle Counter*
Model and serial number of instrument: *GRIMM WRAS2 CPC S/N 54201607*

Result of physical inspection: *no damages*
Result of functional test: *functional test successful, no problems*

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 5, 2018, calibrated at PTB Braunschweig*

Corrections of electrometer, for instance, differing flow rate: *Within tolerance range (+/-2%); reference: 4.0 l/min, measured: 4.000 l/min*

Software for recording: *LabView 2010; National Instruments; Program „LabCount.vi“*

Date of calibration: *February 13, 2020*
Lab temperature and pressure: *23.15°C, 995 mbar*
Measured aerosol flow rate of CPC: *0.3 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	10
Number concentration (cm-3)	1084	1384	1283	1181	1097
Counting efficiency η	0.92	0.91	0.86	0.81	0.68
Particle size (nm)	09	08	07	06	05
Number concentration (cm-3)	1282	1182	790	548	361
Counting efficiency η	0.65	0.60	0.55	0.47	0.38



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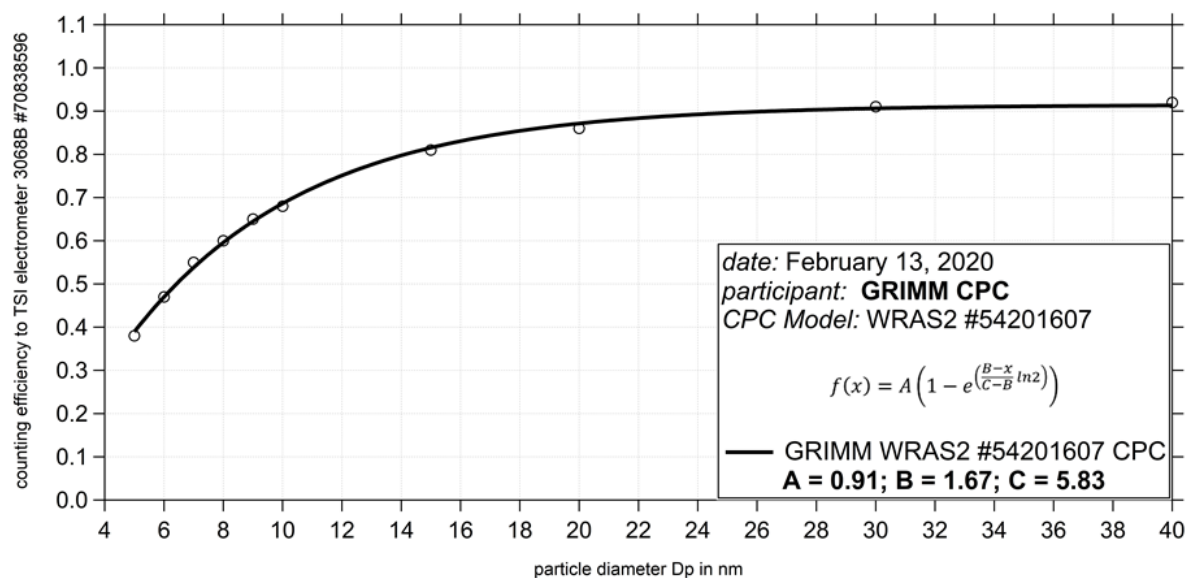


Fig. 1: Counting efficiency for CPC WRAS2 S/N 54201607 pulse output against aerosol electrometer 3068 S/N 70838596; silver particles between 5 and 40 nm were used for calibration; the calculated D_{p50} is 5.83 nm.

Results (using software output):

Particle size (nm)	40	30	20	15	10
Number concentration (cm-3)	1133	1446	1340	1233	1147
Counting efficiency η	0.96	0.96	0.90	0.84	0.71
Particle size (nm)	09	08	07	06	05
Number concentration (cm-3)	1341	1237	824	573	377
Counting efficiency η	0.67	0.63	0.57	0.49	0.4



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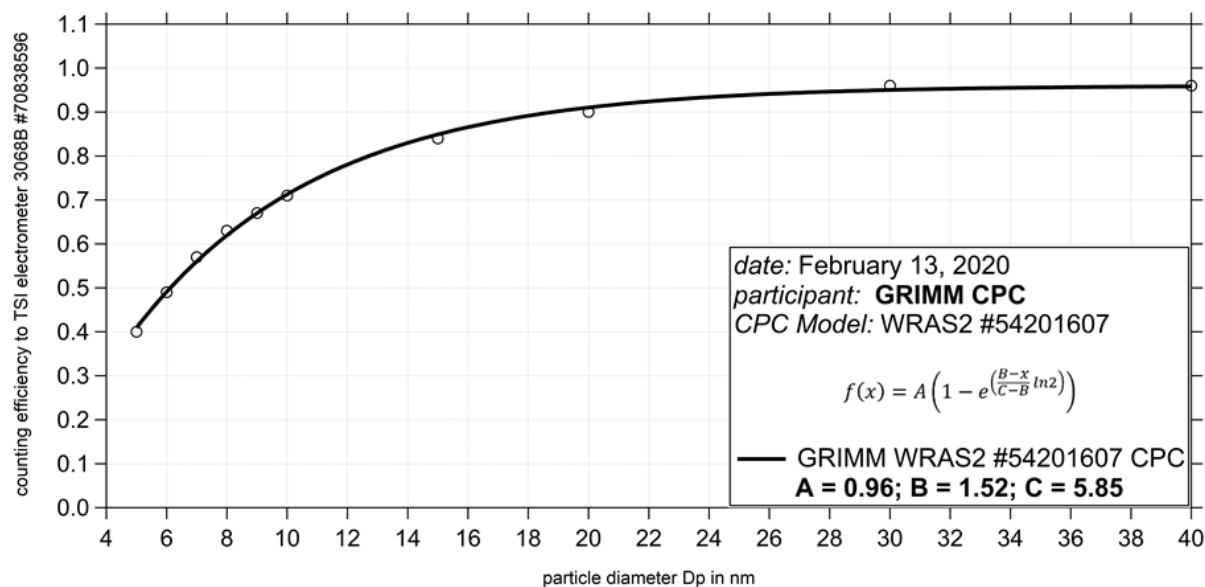


Fig. 2: Counting efficiency for CPC WRAS2 S/N 54201607 GRIMM-Software against aerosol electrometer 3068 S/N 70838596; silver particles between 5 and 40 nm were used for calibration; the calculated D_{p50} is 5.85 nm.

Date of issue: February 13, 2020

Reference: TSI electrometer, model 3068, SN 70838596

Reviewed: TROPOS / Kay Weinhold