# Intercomparison of Mobility Particle Size Spectrometers

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|---|---|
| *Project No.:* | *CPC-2018-1-5* |
| *Principal Investigator:* | Alfred Wiedensohler |
| *Home Institution:* | Leibniz Institute for Tropospheric Research |
| *Participant:* | - |
| *Candidate:* | **DE-TROPOS Reference MPSS No.5** |
| *Made by:* | TROPOS |
| *Counter (SN):* | TSI CPC Model 3772, SN: 3772141701 |
| *Software:* | Labview TROPOS 6.68 |
| *Candidate:* | **DE-TROPOS Reference MPSS No.6** |
| *Made by:* | TROPOS |
| *Counter (SN):* | TSI CPC Model 3772, SN: 71011009 |
| *Software:* | Labview TROPOS 6.68 |
| *Location of the quality assurance:* | TROPOS Leipzig, lab 118 |
| *Comparison period:* | February 19, 2018 – February 23, 2018 |
| *Last Intercomparison (with Project No.):* | |



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**Summary of Intercomparison:**

*Pre-Status:*
The candidate passed the quality standards of ACTRIS and GAW during the incoming checks. The system is within the range of +/-10% of the TROPOS Reference MPSS.

*Final Status:*
The candidate passed the quality standards of ACTRIS and GAW.

**Information about the instruments:**

**Date of check: February 19, 2018**

| *List of Components* | TROPOS Reference MPSS No.5 | TROPOS Reference MPSS No.6 |
|---|---|---|
| *Position* | Line 1 | Line 1 |
| *Company* | TROPOS | TROPOS |
| *Software* | TROPOS | TROPOS |
| *CPC-MPSS* | TSI CPC, Model 3772 | TSI CPC, Model 3772 |
| *CPC-total* | TSI CPC, Model 3772 | TSI CPC, Model 3010 |
| *flow ratio* | 1.0 : 5.0 | 1.0 : 5.0 |
| *source* | Kr.85 | Ni63 |
| *HV power supply* | positive | positive |
| *DMA* | Hauke medium | Hauke medium |
| *aerosol dryer* | ✓ | ✓ |
| *aerosol RH- sensor* | ✓ | ✓ |
| *aerosol T-sensor* | ✓ | ✓ |
| *sheath RH-sensor* | ✓ | ✓ |
| *sheath T-sensor* | ✓ | ✓ |
| *Sheath dryer* | ✓ | ✓ |
| *pressure sensor* | ✓ | ✓ |



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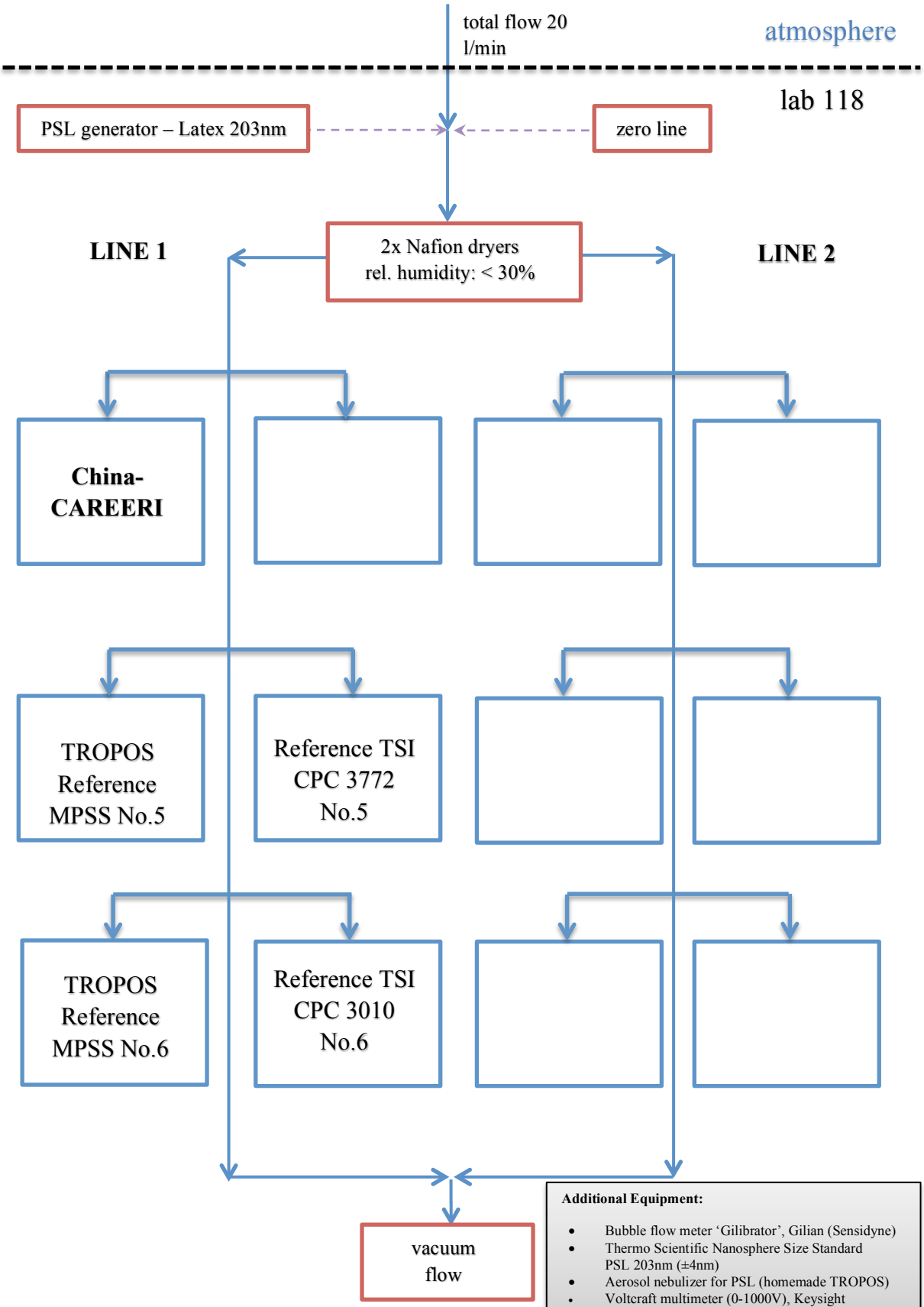
**Laboratory setup:**




**Additional Equipment:**

- Bubble flow meter 'Gilibrator', Gilian (Sensidyne)
- Thermo Scientific Nanosphere Size Standard PSL 203nm (±4nm)
- Aerosol nebulizer for PSL (homemade TROPOS)
- Voltcraft multimeter (0-1000V), Keysight Technologies



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**Instrument: TROPOS Reference MPSS No.5**

| *date* | 19.02.2018 | 20.02.2018 | 21.02.2018 | 22.02.2018 | unit |
|---|---|---|---|---|---|
| *total CPC flow* | 1.005 | 1.007 | 0.997 | | l/min |
| *aerosol flow (DMA)* | | | | | l/min |
| *aerosol flow (UDMA)* | | | | | l/min |
| *aerosol flow (total)* | 1.015 | 1.022 | 1.011 | | l/min |
| *Zero MPSS* | 0 | | 0 | | #/cm³ |
| *Zero total CPC* | 0 | | 0 | | #/cm³ |
| *PSL 203 nm* | | | 204 | | nm |
| *HV – 0 V* | 0 | | 0 | | V |
| *HV – 4 mV* | 5.01 | | 5.0 | | V |
| *HV – 800 mV* | 1000 | | 1000 | | V |

**Instrument: TROPOS Reference MPSS No.6**

| *date* | 19.02.2018 | 20.02.2018 | 21.02.2018 | 22.02.2018 | unit |
|---|---|---|---|---|---|
| *total CPC flow* | 1.014 | 1.016 | 1.013 | | l/min |
| *aerosol flow (DMA)* | | | | | l/min |
| *aerosol flow (UDMA)* | | | | | l/min |
| *aerosol flow (total)* | 1.007 | 1.013 | 0.999 | | l/min |
| *Zero MPSS* | 0 | | 0 | | #/cm³ |
| *Zero total CPC* | 0 | | 0 | | #/cm³ |
| *PSL 203 nm* | | | 202.85 | | nm |
| *HV – 0 V* | 0 | | 0 | | V |
| *HV – 4 mV* | 4.99 | | 5.00 | | V |
| *HV – 800 mV* | 1000 | | 1000 | | V |



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## PSL Scan and calibration: Latex 203 nm +/- 4 nm

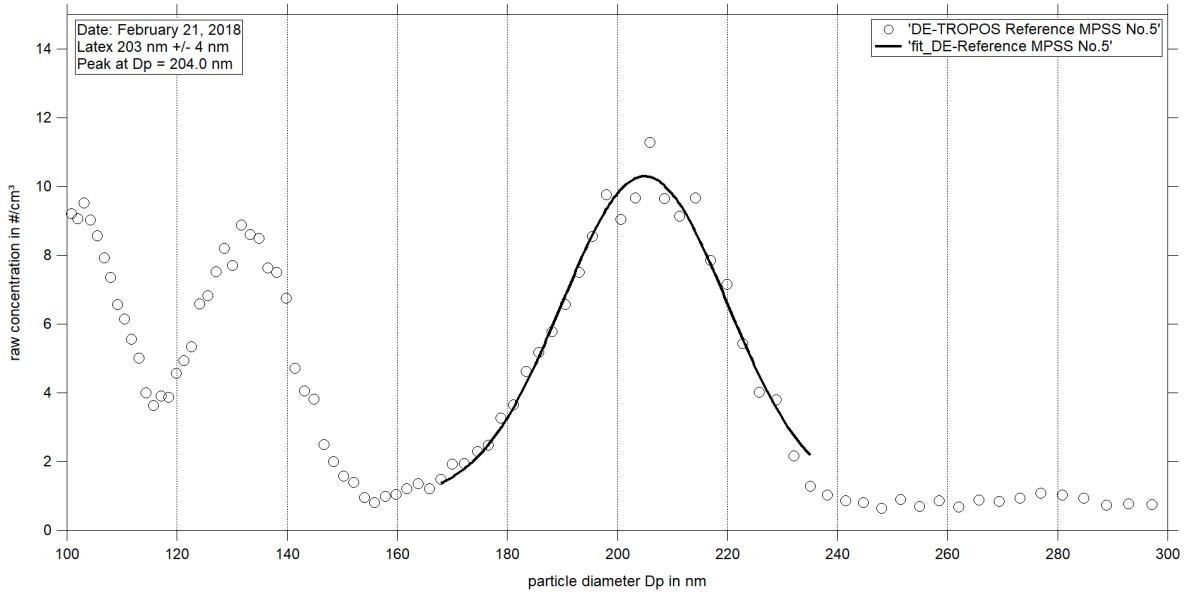


**Figure 01:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on February 21rd, 2018.

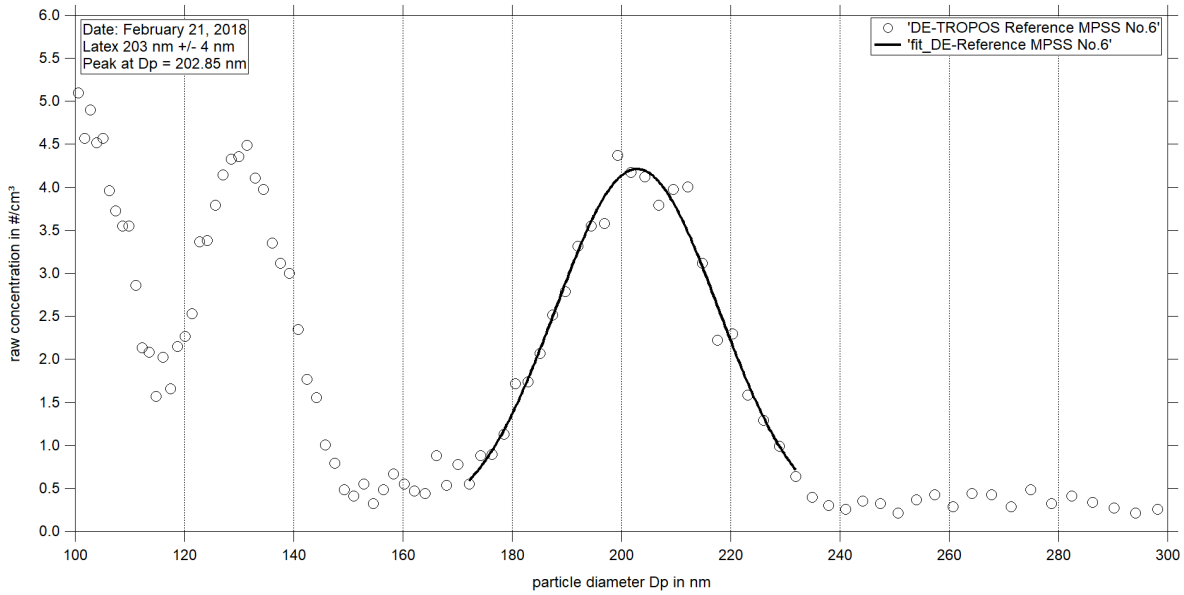


**Figure 02:** Measurement of latex 203 nm: Particle size distribution (raw concentration) for latex 203 nm on February21rd, 2018.



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## Status of the TROPOS Reference MPSS: Time Series

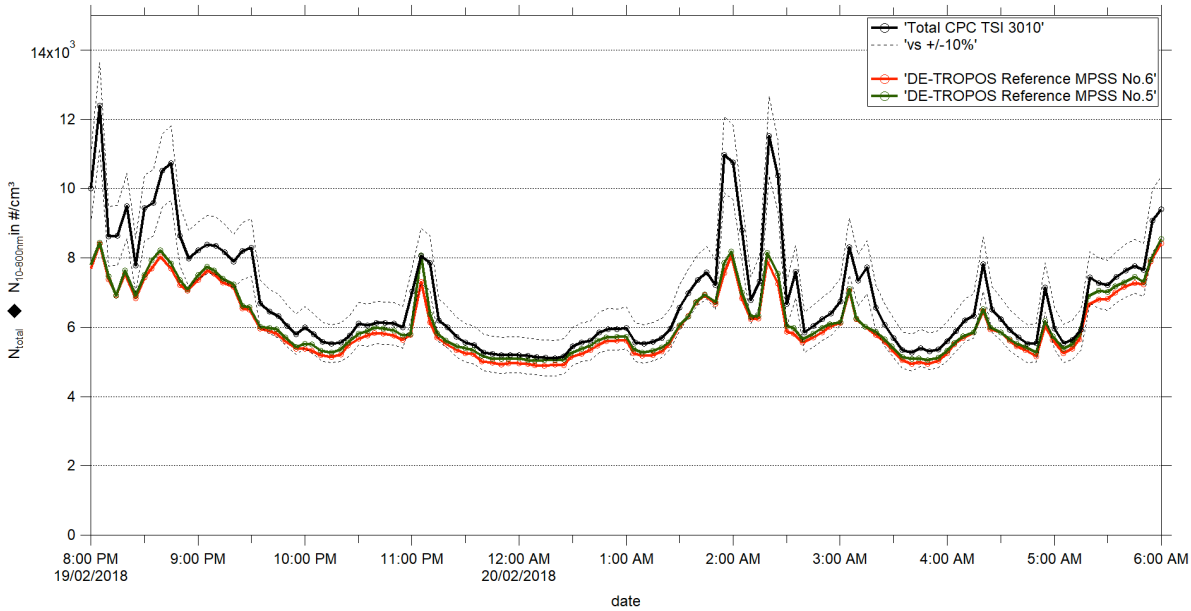


**Figure 03:** Time series (February 19, 2018 08:00 PM – February 20, 2018 06:00 AM) of the integrated particle number concentration ($N_{10\text{-}800nm}$) of the TROPOS Reference MPSS and total number concentration ($N_{total}$) of the Reference TSI CPC 3010. The inversion was performed using TROPOS software. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.

## Status of the TROPOS Reference MPSS: Particle Number Size Distribution

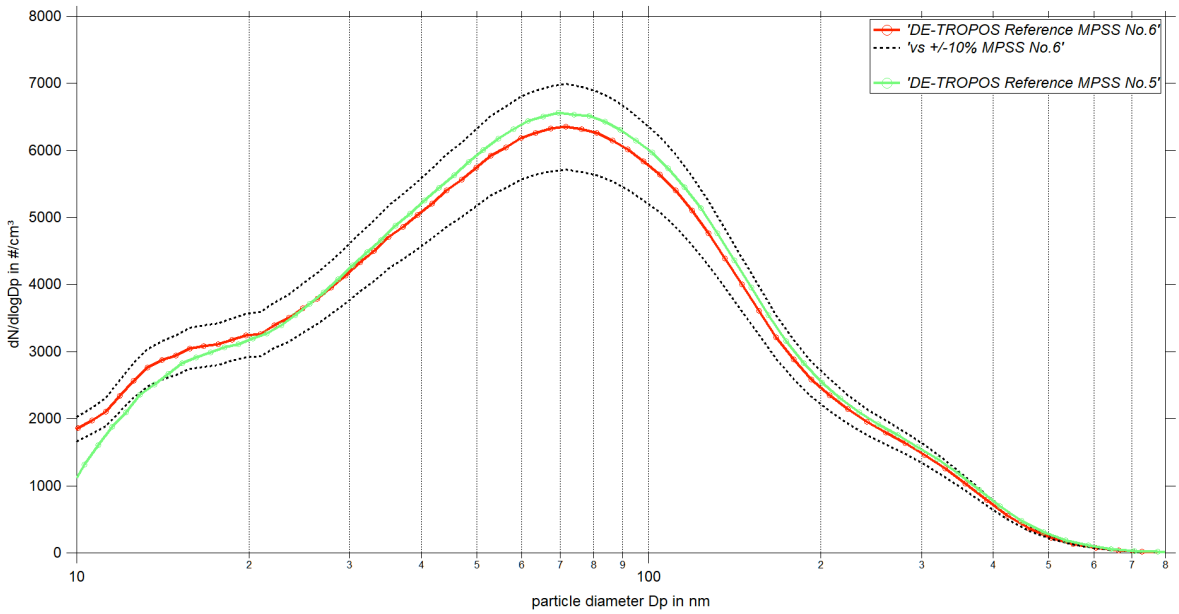


**Figure 04:** Comparison of mean particle number size distribution of TROPOS Reference MPSS No.5 and No. 6 from February 19, 2018 08:00 PM – February 20, 2018 06:00 AM. Multiple charge correction, internal diffusion losses and CPC efficiency are included for both of the TROPOS Reference MPSS.



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## Status of the TROPOS Reference Instruments Correlation

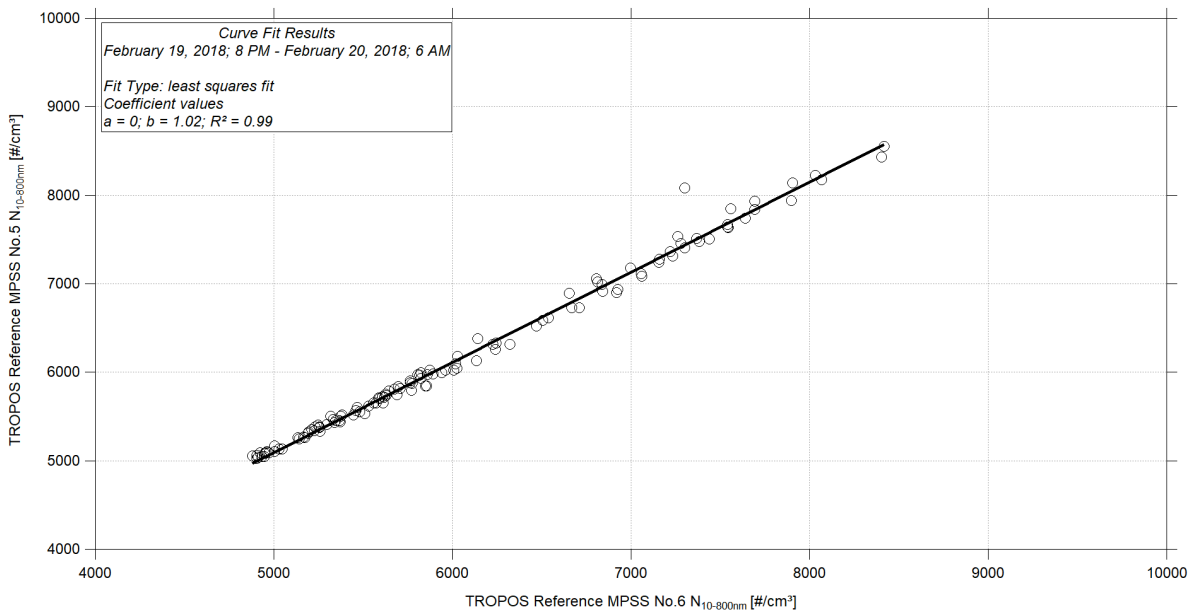


**Figure 05:** Linear regression between the number concentrations of the TROPOS Reference MPSS No.5 and TROPOS Reference MPSS No.6. Multiple charge correction, internal diffusion losses and CPC flow corrections are included.



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