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Characterization and cross-validation of particle measurement instruments

Characterization and Cross-Validation of particle measurement technique

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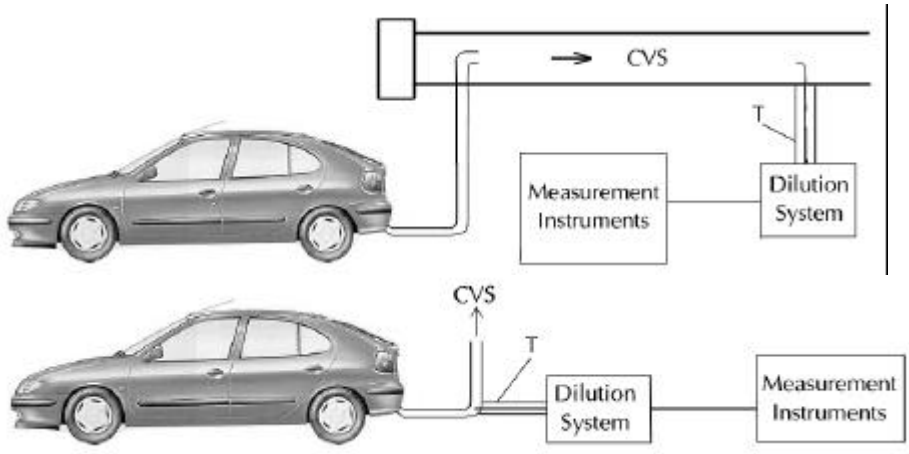
"What is the most realistic sampling system and measurement technique" this kind of questions are questions of the measurement set-up (Question of using a CVS tunnel), Sampling system, Dilution system, ...

My takl is focused more on the instruments themselves, especially on the dilution units, the SMPS and ELPI.

Measurement Setup



Particulate measurement instrument need to be handled with care and need to be checked and serviced. The frequency of service depends on the frequency of use.

Cleaning of Instruments

50 hours: Impactor

1000 hours: Analyzer Collector Rod
Analyzer Outer Tube

2000 hours: Neutralizer

4000 hours: Clean Flowmeters
Replace Filters

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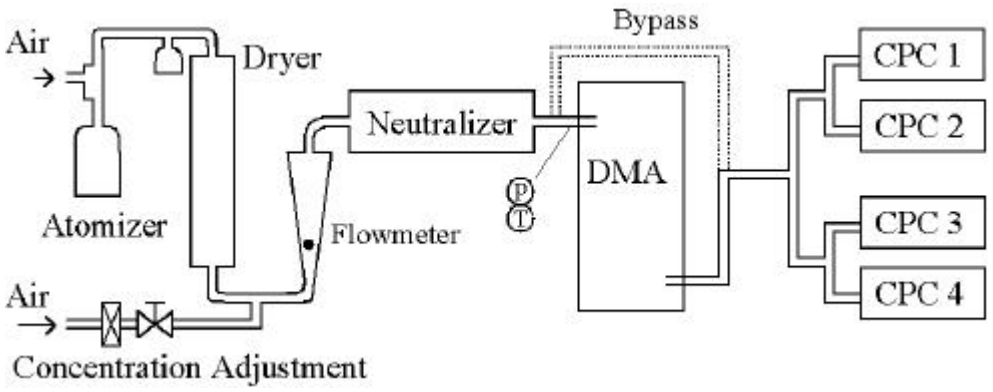
Comparison of CPC'2:
Are the CPC's measuring exactly the same amount of particles ?

CPC Comparison



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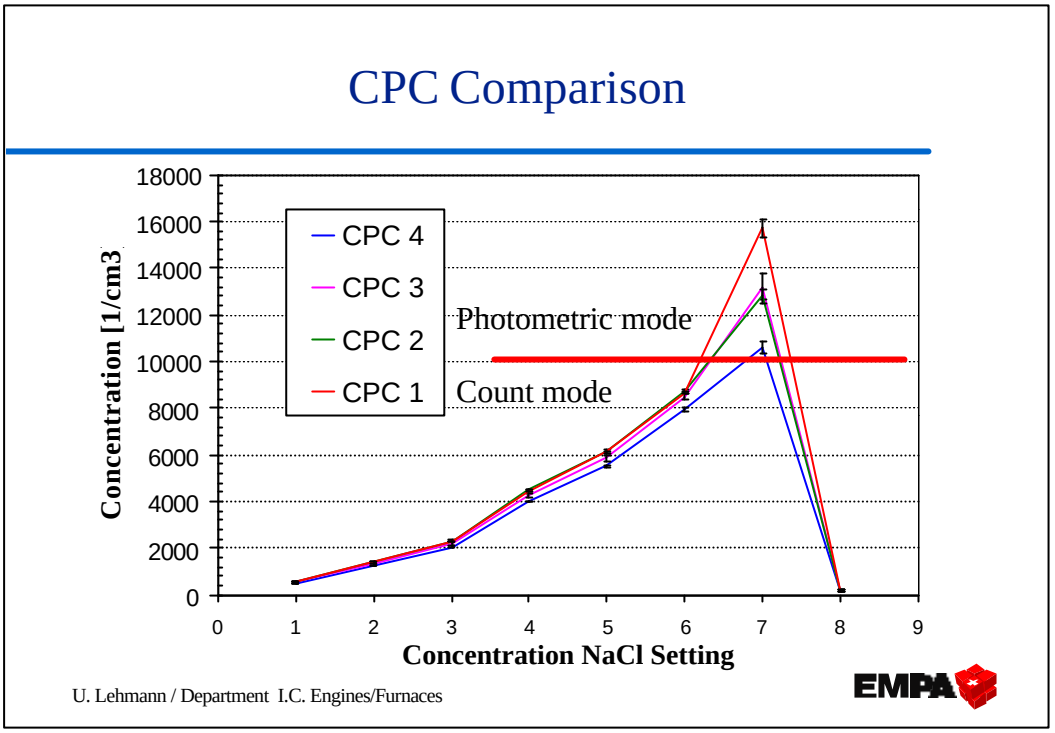
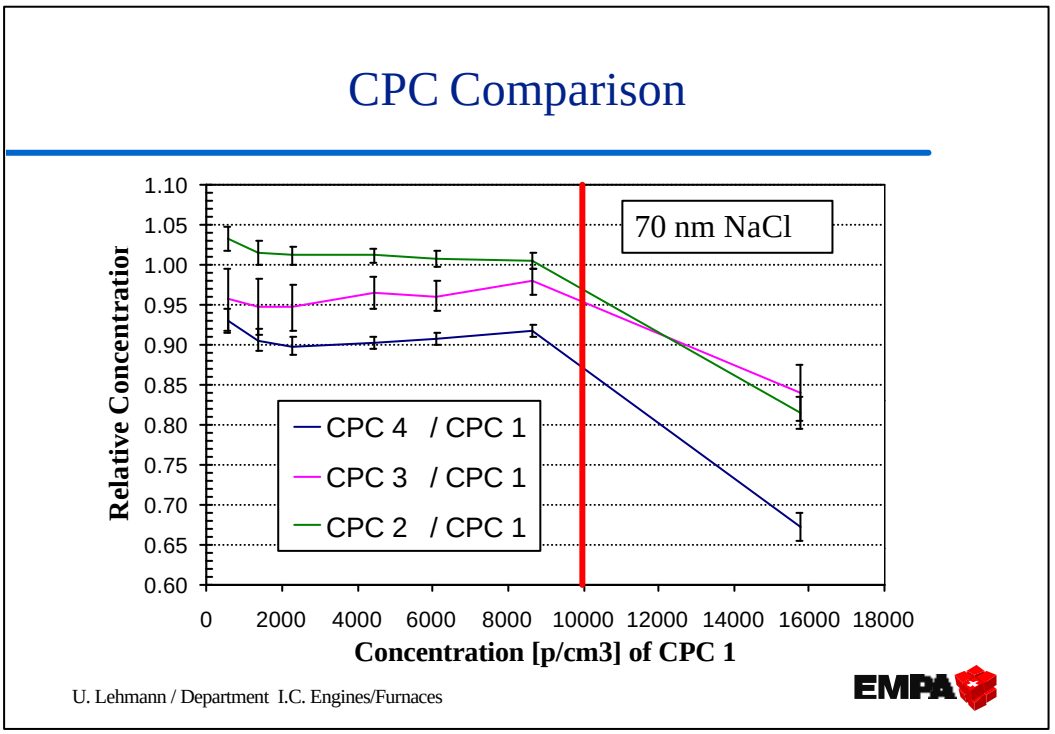


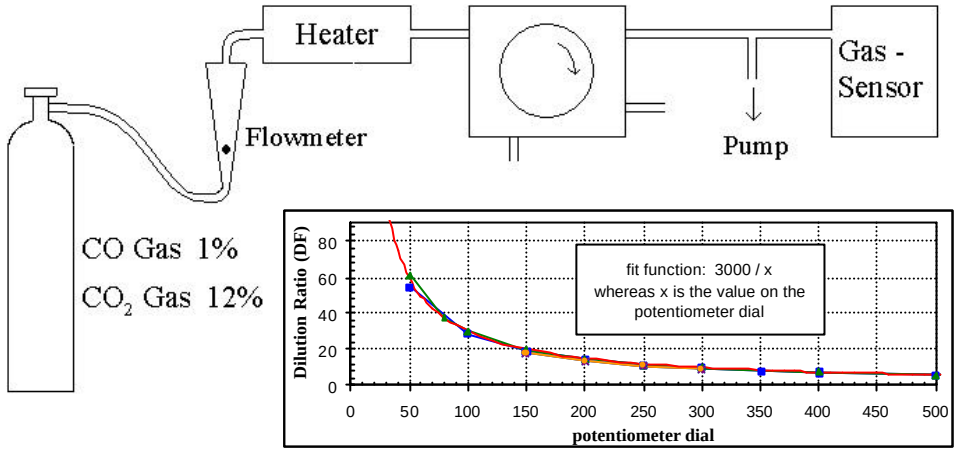
Measuring NaCl concentrations below 10'000 p/cm^3, all CPC's are measuring quite the same amount of particles (beside the 10% accuracy given by TSI).

At concentrations above 10'000 p/cm^3, the instrument measures the total light scattered from all droplets present in the viewing volume at any time.



Calibration of dilution units:
(this calibration results is only valid for our equipment)

Rotating Disk Calibration



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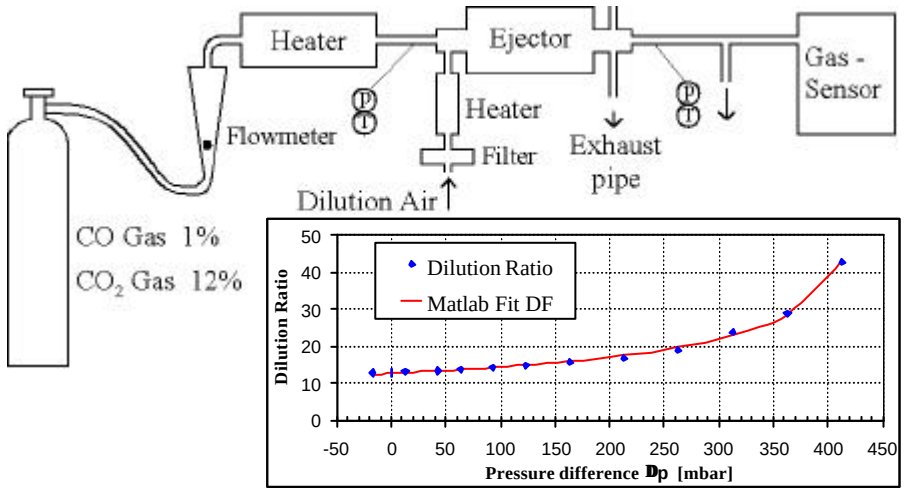
Ejector Calibration



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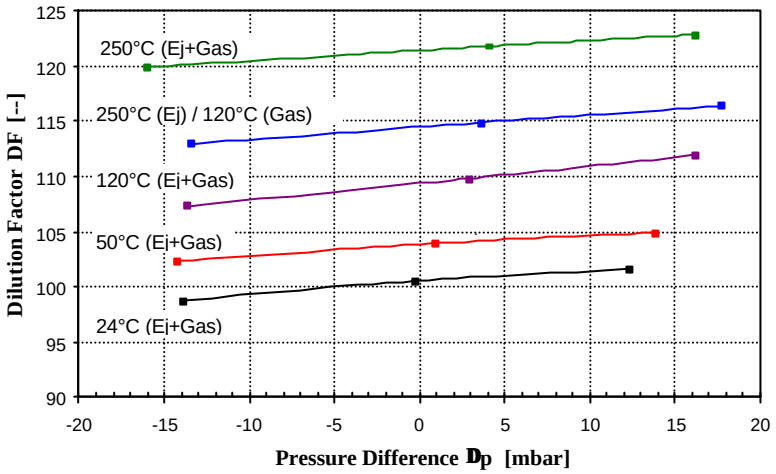
The dilution ratio is changing using different temperatures of the inlet aerosol and the temperature of the dilution gas/dilution unit.

Ejector - Temperature



Double stage Ejector

first Ejector: heated

Inlet Aerosol: heated

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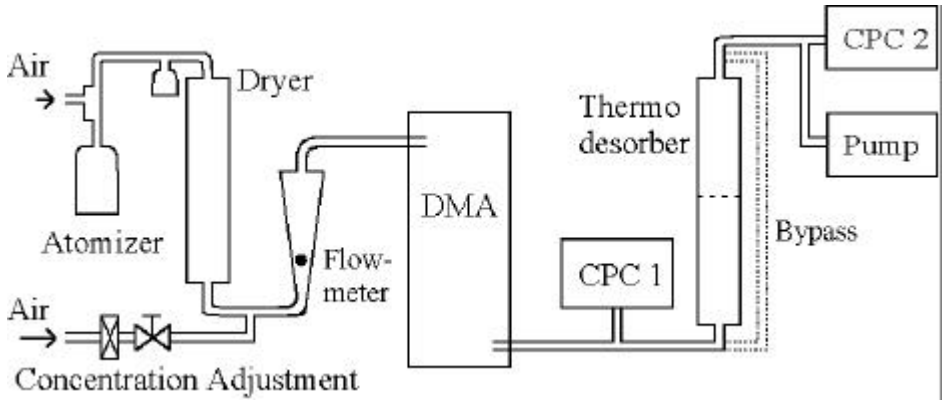
Calibration of the Thermodesorber (EMPA Thermodesorber)

Thermodesorber Calibration



Flow Rate in TD Q = 1.4 l/min

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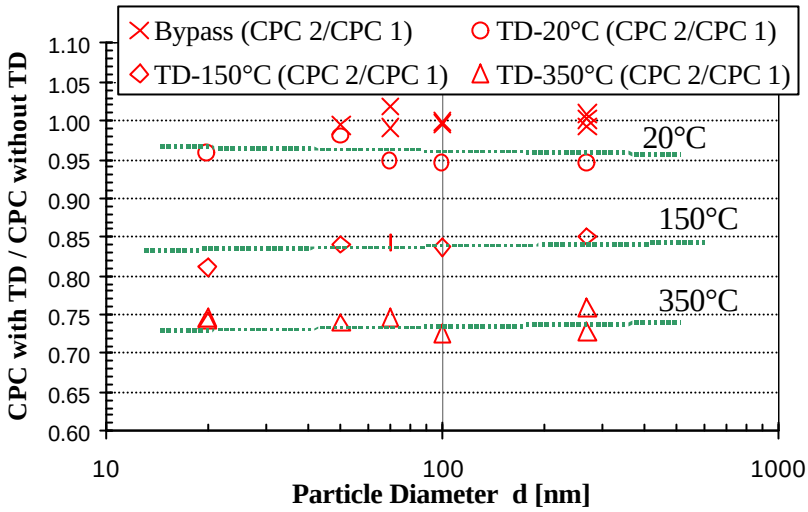
Thermodesorber Calibration



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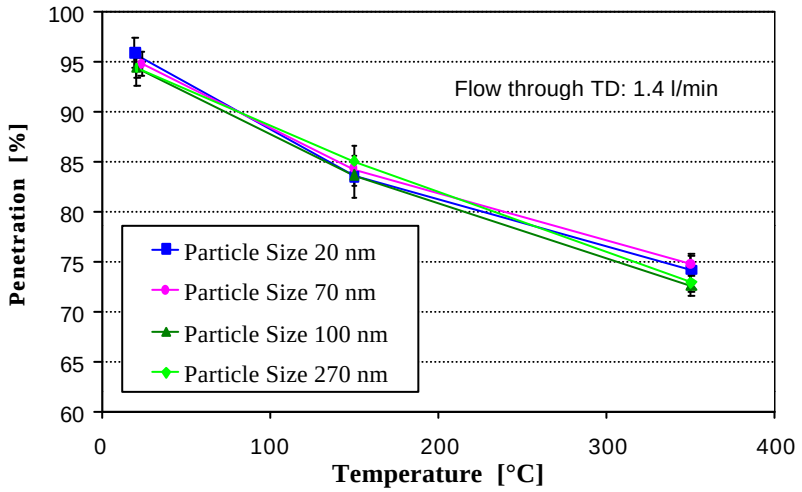
Measured losses in Thermodesorber



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