Characterization and cross-validation of particle measurement instruments
"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 task 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**

<table>
<thead>
<tr>
<th>Time</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 hrs</td>
<td>Impactor</td>
</tr>
<tr>
<td>1000 hrs</td>
<td>Analyzer Collector Rod</td>
</tr>
<tr>
<td></td>
<td>Analyzer Outer Tube</td>
</tr>
<tr>
<td>2000 hrs</td>
<td>Neutralizer</td>
</tr>
<tr>
<td>4000 hrs</td>
<td>Clean Flowmeters Replace Filters</td>
</tr>
</tbody>
</table>

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

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

**Ejector - Temperature**

![Diagram](image)

**Calibration of the Thermodesorber (EMPA Thermodesorber)**

**Thermodesorber Calibration**

![Diagram](image)

Flow Rate in TD  $Q = 1.4 \text{ l/min}$
Thermodesorber Calibration

![Thermodesorber Calibration Graph](image1)

Measured losses in Thermodesorber

![Measured losses in Thermodesorber](image2)