

## **ACTRIS Recommendation for measurements with the Ecotech Integrating**

## Nephelometers 3000 or 4000 - Part II Standard Operation Procedure

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## **Standard Operation Procedure and System Checks**

For long-term light scattering measurements, we recommend the following listed items to improve the quality of the measurements.

- Leak testing of the nephelometer should be part of the regular maintenance schedule for the instrument.
- The different system photons counts should be checked after each deployment and once per year. The shutter photons counts for all 3 wavelengths should be between 0.8 and 1.3M. The measure photons counts should be between 1000 and 20000; the dark photons count should be below 1000.
- The humidity and temperature sensor inside the measurement cell has to be checked prior to their deployment and afterwards at least once per year.
- Calibration should be performed every 3 months using highly pure CO2 (>99.9%). Values for the different wavelengths are given in table 1. Note that these values are normalized to 0°C and 1013hPa. The calibration coefficients (parameters M & C) should be recorded before and after each calibration.

| Aurora Readings Full Scattering |  |                 |        |        |        |        |        |
|---------------------------------|--|-----------------|--------|--------|--------|--------|--------|
| wavelength                      |  | CO <sub>2</sub> | fm200  | SF6    | r12    | r22    | r134   |
| 450                             |  | 44.21           | 392.68 | 157.62 | 392.95 | 179.31 | 174.37 |
| 525                             |  | 23.86           | 211.93 | 85.07  | 211.93 | 96.77  | 94.11  |
| 635                             |  | 11.15           | 99.02  | 39.72  | 99.02  | 45.22  | 43.97  |
|                                 |  |                 |        |        |        |        |        |
| Aurora Readings Backscatter     |  |                 |        |        |        |        |        |
| wavelength                      |  | CO <sub>2</sub> | fm200  | SF6    | r12    | r22    | r134   |
| 450                             |  | 22.11           | 196.34 | 78.81  | 196.34 | 89.66  | 87.19  |
| 525                             |  | 11.93           | 105.97 | 42.54  | 105.97 | 48.39  | 47.06  |
| 635                             |  | 5.58            | 49.51  | 19.86  | 49.51  | 22.61  | 21.99  |

Table 1: High span gas light scattering readings for different gases. All coefficients are for high purity gases (>99.9%) and normalised to 0 °C and 1013hPa.

- The automatic Zero-check of the system should be enabled and performed daily. The zero check should be between -2Mm<sup>-1</sup> and 2Mm<sup>-1</sup>.
- The nephelometer should be operated in an environment of 0-40°C to avoid a malfunction photomultiplier tube.