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Performance Evaluation of Four Commercial Optical Particle Counters

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ABSTRACT

The performances of four optical particles counters, Aerosol Spectrometer (Grimm 1.108), Enviro Check (Grimm 1.107), DustMonit and ParticleScan, were evaluated in laboratory tests employing monodisperse aerosol particles. The study focused on how commercial instruments perform during routine measurements respect to OPC scientific understanding, because it is important for users of such instruments to be aware of their limitations. Measurements were performed using aerosol generated by a Monodisperse Aerosol Generator (MAGE), which produced carnauba wax particles of diameter (1.00 ± 0.08) μm and (1.40 ± 0.15) μm, and monodisperse Polystyrene Latex (PSL) aerosol with nominal diameter of 1.0μm. The results show comparable total particle number concentrations for all the counters, when the count of the first size channel (0.3 - 0.4 μm) for the 1.108 Grimm counter was left out. In the said channel the Grimm counter 1.108 always showed much higher particle counts than those inferred from the tested aerosols. The overcount was proved by the fact that the aerosol sampled in each test on a Nuclepore filter showed no particles in the 0.3 - 0.4 μm range when examined under Scanning Electronic Microscope (SEM). The presence of an artefact produced by the counter was assumed as a likely explanation. For all the counters, the Count Median Diameters (CMDs) of aerosol size distributions, were far below the expected value for the aerosol used. The nearest CMD values to the expected ones were shown by the Grimm 1.107 counter.

KEYWORDS

Optical Particle Counter; Air quality; Aerosol Size Distribution

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