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INCREASING THE SINGLE PARTICLE COUNTING RANGE OF A CONDENSATION PARTICLE COUNTER. FREDERICK R. QUANT, Derek R. Oberreit, Quant Technologies LLC, Blaine, MN; Mark R. Stolzenburg, University of Minnesota, Minneapolis, MN

Since the development of continuous-flow condensation particle counters (CPC), the ability to count single particles has been applied as a technique to infer the particle concentration of aerosols. Single particle counting operation is desirable as a means of measuring particle concentrations because it relies on fundamental parameters: the numeric count of high signal-to-noise particle events, time, and flow rate. The presence of a particle in the viewing volume causes a period in which no additional particles can be detected (dead-time). For increasing particle concentrations, statistical particle coincidence in the detection volume increases. Since these coincident particles are not measured, the concentration accuracy decreases with increasing concentration. This typically defines the upper concentration limit of the CPC or the point at which the instrument switches to a photometric mode of operation. The photometric concentration reported by a CPC is based on a calibrated conversion of photodetetor signal to particle concentration. These calibrations are not trivial to perform or easily verified. The coincidence corrections including corrections for counter dead-time have been used for many years to extend the single particle counting range of a CPC. Corrections of less than a factor of two have been performed in real-time on some commercial CPCs. This work demonstrates the application of dead-time measurement to extend the usable range of the single particle counting mode of a CPC. Precise measurement of dead-time along with the application of correction factors allows a further extension of the single particle counting range of a CPC. The real-time single particle counting range of a CPC was extended to conditions where the resulting dead-times exceeded 80% of the sample period.