Review to “Performance analysis of the NanoScan SMPS and the Mini WRAS Ultrafine Aerosol Particle Size Spectrometers”

The authors present performance evaluations of two portable instruments against reference instrumentation for the measurement of particle number size distributions (PNSD) and total particle number concentration (PNC) during the workshop conducted at the World Calibration Center for Aerosol Physics (WCCAP) in Leipzig, Germany, in January 2020. The performances and uncertainties of the NanoScan SMPS (TSI, model 3910), and the Mini WRAS (Grimm, model 1371) were investigated against the WCCAP Mobility Particle Size Spectrometers (MPSS) and Condensation Particle Counters (CPC) using ambient aerosols and lab-generated PSL and NaCl particles. The inter-comparisons were performed both before and after the service and maintenance, and recommendations of timely service, maintenance and calibration were proposed, which will be instructive to the users. The manuscript is easy to follow and fits the scope of Atmospheric Measurement Techniques. However, I feel that the authors could provide more detailed work to demonstrate how service and maintenance improve the performance of the instruments, which will serve as valuable guidance for both existing and potential users. The reviewer recommends accepting this manuscript after addressing the following comments.

Major comments:

1) The NanoScan SMPS and the Mini WRAS are portable and easy to use. But considering their inferiorities in both the time and size resolution, they may not be a great choice for mobile-platform measurement. Both the NanoScan SMPS and the Mini WRAS are not considered as fast (i.e., time resolution of 60 s). The new generation SMPS (e.g., TSI model 3938) can provide fast scan measurements (e.g., 15s and below, https://tsi.com/products/particle-sizers/scanning-mobility-particle-sizer-spectrometers/general-scanning-mobility-particle-sizer-(smps)-3938/).
2) If possible, I recommend the authors provide performance evaluations of the instruments based on their factory calibration, and analyze how the performance would change during long-term operations, such that the users could have a professional application note to follow.
3) The author claimed that the TSI NanoScan SMPS instruments were significantly improved after service and maintenance, based on the comparisons of ambient PNSD measurement before and after maintenance. However, it is noticeable that the ambient PNSD of the two measurement periods are quite different. If the comparison is demonstrated by relative errors (i.e., concentration ratios), I suspect the relative error may still be comparable.
4) By comparing Fig. 2 and Fig. 3, I am wondering why the TSI NanoScan SMPS failed to capture the size distribution of particles in the ultrafine mode from the PSL solution, but got reasonably good agreements when measuring ambient aerosols of the similar size range (i.e., 10 ~ 50 nm). Same for the GRIMM Mini WRAS (except for the one from UNICATT).

5) If possible, please clarify how the sizing-relevant parameters (e.g., flow and/or voltage) look like before and after maintenance, especially the NanoScan SMPS from FMI2 which behaves quite differently after maintenance. I think that may help guide the users on how often to service the instrument.
6) With respect to the WCCAP MPSS, the NanoScan SMPS underestimated the PNC in the ultrafine aerosol mode for the intercomparison of ambient measurement, but overestimated the PNC when testing the polydisperse NaCl particles. Do the authors have any explanations for that?

Minor comments:

1) Table 1 row 1: Please also specify the particle counting technique of the NanoScan SMPS.