

Referee comment for egusphere-2024-928 “Measurement report: The Fifth International Workshop on Ice Nucleation Phase 1 (FIN-01): Intercomparison of Single Particle Mass Spectrometers” by Shen et al.

The manuscript describes the intercomparison and blind testing of five Single Particle Mass Spectrometers (SPMS) that were operated in parallel at the AIDA aerosol chamber. A number of different aerosol types were supplied to the chamber and size distribution measurements as well as mass spectra for the SPMSs were compared. Correlations between the instruments and between the different particle types are discussed. Two blind experiments were conducted where a mixture of three particle types (SOA, soil dust and graphite soot) were supplied to the chamber, but the participants of the blind experiments did not know about the particle types, sizes and relative fractions.

The intercomparison constitutes an important study to evaluate the performance and limitations of SPMS instruments. Although the instruments are demonstrated to be generally capable of identify and classify different aerosol types, the (quantitative) results can vary widely (e.g., Fig. 10, P1, ALABAMA suggests >90% pure SOA particles, while ATOFMS detects Illite NX and K-feldspar in >90% of the particles).

My main comment concerns the discussion of the blind tests. This discussion should be expanded. The authors should add the pie charts of the mixture introduced into the chamber (already shown as inserts in Fig. 2) again in Fig 10. It is noteworthy that the miniSPLAT with calibration is able to accurately reproduce the original particle mix. The discussion of the calibration procedures for miniSPLAT should be expanded and/or a reference for the calibration procedures should be given. Can such a calibration be regularly achieved, e.g., for field measurements? Furthermore, it should be discussed whether such calibration would also be possible for the other instruments. It should be discussed to what extent measurements of the individual SPMS instruments are considered to be not quantitative at all, or semi-quantitative, or quantitative after calibration. Can uncertainties be provided for each instrument? A strong caveat should be added that some seemingly obvious interpretations of such pie charts from SPMS results are not possible, and that such pie-charts can potentially be quite misleading (e.g., ALABAMA classifying >90% of the particles as SOA does not mean that the aerosol is actually dominated by SOA; four instruments seeing less than 5% soot particles does not mean that soot is only a minor component of the aerosol, etc.).

Overall, the manuscript is well written and clear. The manuscript is clearly suitable for ACP after considering my main comment. The comprehensive intercomparison of the performance of the individual SPMS instruments is very insightful and valuable for interpreting SPMS results in general and for understanding the current limitations of each instrument.

Technical correction:

Line 857: “Note that...”