Response to comment

We would like to thank Dr. O. Bischof for the positive feedback. Please find below the point-to-point response to the questions raised.

- The authors state that "In this study, we challenged six different DC-based PN-PTI instruments…". Please explain why you chose to only investigate DC-based instruments and not complement their performance with CPC-based PN-PTI models such as the MAHLE PMU 400 (respectively the Brainbee PMU-400) or the BEA 090 made by Robert Bosch.

  Answer: The six different DC-based PN-PTI instruments investigated in this study were chosen based on purely practical reasons: these instruments have been type-approved in Switzerland and we had access to the model prototypes. Unfortunately, none of our collaborators/partner institutes in Switzerland had a MAHLE PMU 400 instrument to lend us, thus this instrument could not be characterised. However, another CPC-based PN-PTI instrument, namely the NPET 3795 (TSI Inc., USA), was characterised in our previous study (Vasilatou et al. 2023; https://doi.org/10.1016/j.jaerosci.2023.106182). As expected, the plateau counting efficiency of the NPET 3785 did not depend on the morphology or the particle charges of the test aerosol.

  We have amended the text as follows: "We focused on DC-based instruments because we expect a larger impact of the aerosol properties on their response compared to CPC-based ones (Vasilatou 2023)".

- It was surprising to see that in case of the MISG, only particles with a GMD of 100 nm were generated, so only one particle size distribution. Have you tried to operate it with a different air/fuel ratio (AFR) or with a fuel other than the mixture of dimethyl ether and propane? It seems odd to see only one data point for the MISG, e.g. in Fig. 3. Note that Bischof et al. (2019) have used the MISG as a calibration aerosol source to determine the counting efficiency of CPCs with DMA-selected particles down to the small nanoparticle size range.

  Answer: Actually, our results are in agreement with those reported by Bischof et al. (2020). The modal diameter in their study was 95-158 nm. The concentration achieved at small sizes (<2000 cm^{-3}) is not sufficient for DC-based instruments.

  Moreover, our previous study has shown that the counting efficiency of the PN-PTI instruments can change depending on whether the test aerosols are poly- or monodisperse (Vasilatou et al. 2023; https://doi.org/10.1016/j.jaerosci.2023.106182; Figure 6). We therefore chose to challenge the PN-PTI instruments with polydisperse soot aerosols to simulate the GSD of the soot size distribution emitted by diesel vehicles. We have tried to operate the MISG with different fuels and our findings confirm those by Senaratne et al. 2023 (https://doi.org/10.1016/j.jaerosci.2023.106144), who showed that the smallest GMD_{mob} (about 95 nm) is produced when using a mixture of dimethyl ether and propane.

  We have amended the text as follows: In the case of the MISG, particles with a GMD_{mob} down to 100 nm were produced in a repeatable and stable manner using a mixture of dimethyl ether and propane (Senaratne et al., 2023). "This is in agreement with another study, where the modal diameter varied between 95 and 158 nm (Bischof et al. 2020)."

- You state that mobility particle size distributions were measured simultaneously by SMPS, but you do not show any. A particle size distribution of the test aerosol would be interesting to see, e.g. to show the full size range, its concentrations as well as its mode. As is, we can only assume the aerosol was mono-modal and did not have a nucleation mode (which PN-PTI instruments might experience in real life tests).

Answer: Thank you for this comment. Mobility size distributions are shown in Fig. S1 of the Supplement. We have now added the following sentence to the main manuscript (Line 115) to catch the attention of the readers: "Mobility size distributions are shown in Fig. S1."

- The CAP 3070 instrument is based on the so-called escaping current principle, so it detects the current leaving its sensor on charged particles rather than measuring the total net charge carried by particles after collection on a diffusion screen as most DC-sensors do; see Lehtimäki (1983). Could this difference in measurement principle also be a reason for the larger difference in the counting efficiency observed in chapter 3.2, in addition to "an overestimated internal correction factor"?

Answer: This is a good point. We cannot rule out that the decrease of the counting efficiency at larger particle sizes is not due to the measurement principle of the device. We have therefore amended the main manuscript (Lines 153-154) as follows: "It cannot be ruled out that the measurement principle of the instrument, based on the so-called escaping current principle, plays also a role (Lehtimäki, 1983)."