We thank the Editor and the referees for their careful reading of our manuscript and for their constructive and insightful comments. We have revised the manuscript accordingly, and we believe that these changes have improved the quality and clarity of the paper.

Answers to referee 1 comments:

This paper presents interesting data and valuable findings using alternative technologies to measure both particle number and size distribution. The overall structure is coherent, the narrative is clear, and the study is highly relevant to current discussions on particle number monitoring and instrumentation. The authors provide a balanced evaluation of the benefits and limitations of the data and methods investigated, and the work is generally well-presented and discussed. However, I am recommending Major Revisions. This is primarily due to issues with the Supplementary Material: several referenced figures (notably S3c and S4) are missing or incorrectly referenced, which makes it difficult to follow key arguments related to particle size distributions and sensor cut-off behavior. These figures are essential for following or backing up the claims presented in the paper, and without them, the supporting evidence cannot be properly evaluated.

Answer: Figures, and how they are referenced, have been checked throughout the manuscript.

Additionally, the treatment of "outliers" requires a more rigorous and transparent explanation. The current description does not sufficiently clarify their origin, impact, or the rationale behind their exclusion.

Answer:

The outliers measured during the instrument comparison period are omitted from the boxplot figures (Figs. 1, 2 and 4) to make the figures layout clearer. This information has been added in the text (line 133) and to the figure captions for figures 1,2 and 4. Below are the boxplot figures with the outliers which show that the outliers measured with all the instruments (different AQ Urban sensors and CPCs).

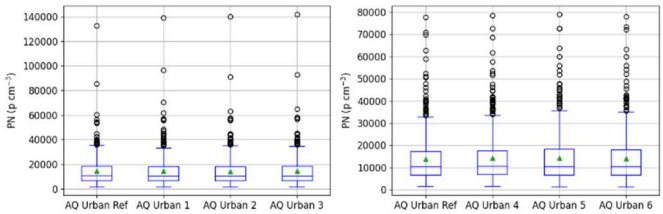

Figure 1 with the outliers.

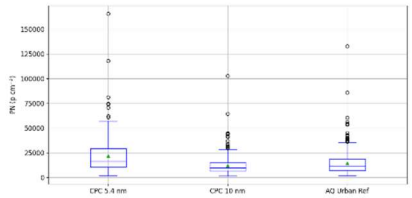

Figure 2 with outliers.

The outliers in boxplot figures are defined so that outliers are measurement values having (in this case concentration) values larger than upper quartile (Q3) plus 1.5 times the difference between upper quartile (Q3) and lower quartile (Q1).

The correlation plots in Figs. S1 and S3 and the time series of AQ Urban sensors (Fig. S2) show that the high PNC are measured with all instruments which indicate that the high PNC are real and not an instrument artifact during the instrument comparison period except for AQ Urban sensor 4 (Fig. S1b) which shows few points that deviate from the linear correlation. In the manuscript, it is mentioned in figure captions that the outliers corresponding to high concentrations are not shown in the figures. In the discussion of correlations (Fig. S1), the few deviant measurement points are also mentioned.

During the 7.5-month measurement period, high concentrations were also measured and again the outliers (high concentrations) were omitted in the figure to make it clearer. Below is Figure 4 with the outliers. However, these are real measurement results measured with the AQ Urban sensor and CPCs. Much higher PN concentrations were measured at the Traffic Supersite which is due to the higher emission of motor vehicles in this site. The discussion of the deviation of measured concentrations between AQ Urban sensors and CPCs at both site is discussed further in the manuscript (Starting from line 233 in the original manuscript and now starting from line 268)

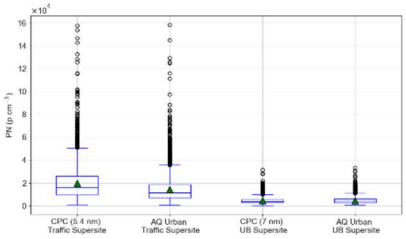

Figure 4. with outliers.

Specific revision points are listed below.

Line 53-54: the sentence begins by explicitly stating “According to EU directive 2024…” but then ends with the phrase “sites with high” and the formal citation “(EU) 2024/2881 (2024)” , this is difficult to read and is left with a possible missing end to the paragraph, a clearer

approach would be to integrate the citation by writing "According to Directive (EU) 2024/2881, PNC monitoring is regulated at..." and include the missing text “sites with high ultrafine particle (UFP) concentrations”

Answer: Text has been modified as the referee recommended.

Line 60-62: could do with being smother and a bit mixed and repetitive. I recommend rephrasing for clarity and flow, with perhaps. “CPC measurements are costly (due to instrument purchase and servicing), and maintaining the system is time-consuming, requiring regular maintenance and frequent butanol refills.”

Answer: Text has been modified as recommended by the referee.

Line 67: incorrect comma usage in "instruments, (AQ™ Urban sensors..." so should be "instruments (AQ™ Urban sensors..."

Answer: The usage of comma has been corrected.

Line 104-107: *1).* not clear if there were there any side-by-side comparisons of the Airmodus A20 and the TSI 3756 to quantify any instrumental bias between the two reference devices before deployment and if so was this applied to the final data? *2).* at the traffic supersite how was the dilution applied to the instrument and how was the dilution factor determined and was it stable throughout the measurement campaign? *3).* what quality assurance or control procedures were applied to the instruments during the campaign.

Answer:

1.) There was no side-by-side comparison of Airmodus A20 and TSI 3756 CPCs. The Airmodus A20 came directly from maintenance at the beginning of the measurement period, and its accuracy is < 10 % up to PNC 30 000 p cm^{-3}. The flow rate of the Airmodus A20 was checked between 2 to 6 weeks. The changes in the flow rate were mainly due to the ambient pressure. For the TSI 3756 CPC the accuracy is about 5 % when the total particle concentration is below 50 000 p cm^{-3}. The accuracy of the DMPS-CPC system is about 20 %.

2.) The dilution in the Traffic Supersite was applied using a bridge dilution. The laboratory test showed that the accuracy of the bridge diluter was 2 %. In the field measurements, the bridge diluter may be prone to contamination, and the dilution ratio is not constant throughout the measurements. The change in the dilution ratio is determined after the measurement, and the measurement data is corrected using a moving correction for the dilution. If estimating the propagation error using a maximum 10 % error for CPC and 10 % error from the dilution, then the total error is around 15 %.

3.) The flow rates of the CPCs were constantly checked, and draining of butanol was done frequently to avoid interference of condensed water. For DMPS silica gel was changed when needed and the flow rate was adjusted if the deviation was > 1 %.

Line 132: mentions “Fig. S1” is the “S” to refer to an additional supplementary figure not supplied/drafting format or a miss type as line 140 refers to Figure 1 which I assume is the intention so perhaps change to “Fig. 1”

Answer: Figure 1 shows the boxplots of measurement data from different AQ Urban instruments during the comparison period. Figure S1 included in the supplement on the other hand shows the correlation between different AQ Urban instruments against the reference AQ Urban instrument.

Line 134: The text states that “AQ Urban sensor 5” showed a lower correlation due to “a few outliers,” and uses the word probably, suggesting the cause has not been clearly identified. Since Figure 1 explicitly excludes outliers from the visualization, its important to clarify the nature of these data points. Were they caused by instrumental issues (e.g., electrometer noise, power interruptions, calibration drift) or by genuine transient high-concentration events? Distinguishing between sensor malfunction and true environmental variability is important for assessing operational reliability and interpreting the final conclusions.

Answer: The number of the AQ Urban sensor was incorrectly written. The AQ Urban that showed lower correlation (0.97) was AQ Urban sensor 4 (original Fig 1b). This has been corrected in the manuscript. Figure S1 has been modified so that the AQ Urban sensors 1-6 are shown in subplots a-f in chronological order to make the figure clearer.

Fig. S1 in the supplement shows the correlation plots of individual AQ Urban sensors against the reference AQ Urban sensor. As can be seen from Fig. S1d (original Fig. S1b), there are four points that clearly deviate from the linear correlation and cause the lower *r* value. It is not clear if these points are caused by occasional differences in the sample entering the AQ Urban sensor number 4 or some disturbance in the instrument itself. However, from the 484 sampling points during this comparison period, the amount of four values with clear differences in one instrument still gives a reasonably good correlation when comparing to PNC measured with the CPC.

Line 138: “Fig. S2” to “Fig. 2” if comment in Line 132 is the same?

Answer: Figure S2 included in the Supplement shows the time series measured with different AQ Urban sensors as written in the text.

Line 144: missing comma between the text “period PNC”

Answer: Comma has been added.

Line 145: remove the comma after “cut-sizes” and rephrase with "cut-sizes of 5.4 nm and 10 nm (Fig. 2)."

Answer: Corrections made as the referee suggested.

Line 149 and 150: “Fig. S3a and S3b” to “Fig. 3a and 3b” if comment in Line 132 is the same?

Answer: Figures 3a and 3b show the diurnal variation of the measured PNC (a) and the PNC difference (b) of CPC’s and AQ Urban reference sensor during the comparison period. Figure S3 shows the correlations between the reference AQ Urban sensor and CPCs with different cut-off sizes during the comparison period. Figure 3S is included in the supplement. Figure 3 has also been corrected since Fig. 3a was not showing the “a”.

Line 155-156: The statement that the 'AQ Urban sensor measures also particles slightly below 10 nm' should be rephrased. As noted in the Experimental section (Lines 96–101), the sensor measures electrical current and calculates PNC based on an assumed unimodal lognormal distribution. It would be more precise to state that the sensor 'detects the charge fraction of particles below 10 nm' or that the 'PNC calculation accounts for the influence of particles <10 nm,' rather than implying a direct counting measurement of them.

Answer: Text has been modified as the referee suggested.

Line 171: unable to locate “Fig S3c” in the article, is this a supplementary figure missing or is it missing from figure 3? As mentioned in comment on line 132.

Answer: Figure S3c is included in the supplement.

Line 182: "cut-of size" please correct to "cut-off size"

Answer: Corrected as the referee suggested.

Line 201–208 (Missing Supplementary Data): The text references "Fig. S4", "Fig. S4a", and "Fig. S4b" to support claims regarding hourly-averaged particle number size distributions. Specifically, the text states that Figure S4 shows an increase in particles <30 nm at the Traffic Supersite during morning rush hours and a decreasing trend for particles <10 nm at the UB Supersite.

However, this figure appears to be missing.

Answer: Figure S4 is included in the supplement.

Figure 5 shows only the diurnal variation of the total PNC, not the size distribution.

Answer: The size distributions are shown in Fig. S4 (hourly averaged) and Fig 7 (monthly averaged).

Figure 6 shows hourly average particle number concentrations

Answer. The figure reference in the text has been corrected to Fig. S6.

Figure 7 shows the monthly-averaged size distributions, which does not provide the hourly resolution required to verify the rush-hour claims.

Answer: Figure S4 shows the hourly-averaged size distributions.

Since this section relies on this specific DMPS data to explain the discrepancy between the AQ Urban sensor and the reference CPCs (attributing it to the <10 nm fraction), it is critical that these hourly size distribution plots are provided. Please verify the Supplementary Material citations and ensure Figures S4a and S4b are included or correct the figures accordingly id required.

Answer: Figures S4a and S4b are included in the supplement and the citations are checked.

Line 120, the station is referred to as "urban rural site" but in line 210 its referred to as "Urban remote site" correct the phrasing to maintain consistency

Answer: The phrasing has been changed to "Rural background" throughout the text and figures to maintain consistency. The slope, offset and correlation coefficients showed minor changes compared to original figures since some measurement points were omitted since we found that there were still some points with uncertain measurement of some measurement devices. This has been taken into account in all other figures also, and the changes are so minor that they have no effect on interpretation of the results.

Line 212, 214, 219, 223, 225, 227, 233, 243, 254: referred to supplementary "Fig. S5", "Fig. S5a" and "Fig. S5b" please review text description or supply the figures if not referring to Figure 5.

Answer: The referring of figures has been checked.

Line 220: "Fig S6" please review text description or supply the figures if not referring to Figure 6.

Answer: The referring of figures has been checked.

Line 245, 254: "Fig S7" please review text description or supply the figures if not referring to Figure 7.

Answer: The original Fig. S7 accidentally showed the PM2.5 concentrations from different sites which were already shown in Fig. S6. Fig. S7 has been corrected. The mass concentration plots are removed, and particle mean diameters from both sites obtained from AQ Urban sensor and DMPS measurements are shown in the new figure.

Line 249: text refers to “Fig. S8” which is missing

Answer: Figure S8 is included in the supplement.

Line 251-252: Regarding Figure 7: The x-axis currently displays particle diameter (Dp) in micrometers (µm) using a log scale (e.g., 10−2). However, the discussion in the text (Lines 254–265) and throughout the manuscript refers to particle sizes exclusively in nanometers (e.g., 'particles smaller than 20 nm' in Line 261, '~100 nm' in Line 268). To improve readability and allow for easier cross-referencing between the text and the visual data, I recommend changing the x-axis units in Figure 7 to nanometers (nm).

Answer: The x-axis units have been changed to nanometers in both figures showing particle number distributions (Figs. 7 and S4).

Line 342: Citing an EU Directive as "Anon" (Anonymous) is non-standard for academic journals. It is usually better to cite the author as "European Union", "European Parliament", or "European Commission"

Answer: The reference has been corrected.

Line 362: The citation for the CEN standard is listed as 'EN 16976:3035'. This appears to be a typo. Based on Line 56, this should refer to 'EN 16976:2024'. Additionally, please correct the spelling of 'Standartization' to 'Standardization' on line 363.

Answer: The reference has been corrected.

Line 385: doesn’t appear to be a complete citation

Answer: The reference has been corrected.

Line 389-381: citation missing the journal name: “Boreal Environmental Research”

Answer: The reference has been corrected.

Line 414: citation missing the journal name: “Aerosol Research, 2, 271-289”

Answer: The reference has been corrected.