

Atmos. Meas. Tech. Discuss., author comment AC1
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Reply on RC1

Gian Lieberherr et al.

Author comment on "Assessment of real-time bioaerosol particle counters using reference chamber experiments" by Gian Lieberherr et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2021-136-AC1>, 2021

Reviewer: *This paper presents interesting data in a very concise and understandable way. The limitations of the study are explained, and further improvements are detailed.*

Response: Thank you very much for the positive feedback.

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Reviewer: *I noted very few minor comments: Lines 88, 98, 114: Does AMT require to specify the address of the manufacturer (at least region and country)?*

Response: Thank you for pointing this out. We have now amended the text as follows:
(DMT, Colorado, USA)

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Reviewer: *Line 173: It is interesting to note that the WIBS-NEO was unable to detect 10 μm PSL, where it should operate up to 30 μm . It would be worth digging a bit more here to at least give hypotheses on what could have happened. What does literature say about detection efficiency of this model of the WIBS for particles larger than 5 μm ? If some studies showed opposite results than yours, where did something go wrong?*

Response: The results are indeed surprising. To the best of our knowledge, only one paper on the counting efficiency of the WIBS-4 by Healey et al. (JAS, 2012) exists. In this study, the authors calibrated the WIBS-4 against a CPC for particles in the size range 0.3 μm – 1.3 μm . We are not aware of any other study on the counting efficiency of the WIBS-4 or WIBS-NEO at larger particle sizes.

It is nevertheless unfortunate that we only calibrated a single WIBS-NEO in our study. Instrument performance depends on several factors, including proper maintenance. Ideally, a calibration campaign should include several devices of the same model to study unit-to-unit variability and correlate instrument performance with maintenance state and service years of the device. However, due to limited availability of WIBS instruments in Switzerland and at partner institutes abroad, we were only able to investigate only one WIBS-NEO in our study.

To avoid any misunderstandings, we now provide more information on the maintenance

status of the instruments.

In Subsection 2.2: The WIBS-NEO employed in our study underwent a service at the manufacturer in early 2017.

In Subsection 2.3: The Rapid-E underwent a service in 2018.

In Subsection 2.4: The Poleno was used as received from the factory.

In Subsection 3.1.1 – Line 173, we amended the text as follows: "This observed drop in the detection rate for bigger particles is somewhat surprising since the WIBS-NEO is expected to be able to detect particles up to 30 μm . Although the exact reasons for this behaviour are unclear, it cannot be ruled out that the specific WIBS-NEO used in our study required a technical service by the manufacturer".

Section 4: More studies are needed to investigate the unit-to-unit variability of the Poleno, Rapid-E and WIBS-NEO bioaerosol monitors. It is known that inadequate maintenance can affect both the sizing accuracy and the counting efficiency of light-scattering instruments (Vasilatou, 2021).

References: K. Vasilatou et al. "Calibration of optical particle size spectrometers against a primary standard: Counting efficiency profile of the TSI Model 3330 OPS and Grimm 11-D monitor in the particle size range from 300 nm to 10 μm ", *Journal of Aerosol Science* **157**, 105818 (2021).

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Reviewer: -Line 175: You mention a lower detection limit at around 2 μm for the Rapid-E, but you only tested 2 μm (no detection) and 5 μm (98% detection efficiency). How do you know the lower detection limit is not 3 μm , or 4 μm ?

Response: We calibrated the Rapid-E monitor at particles sizes 0.5 μm , 1 μm , 2 μm , 5 μm and 10 μm . The detection efficiency is zero at 0.5 μm and 1 μm , but rises to 5% at 2 μm . These data indicate that the Rapid-E already starts to detect particles at 2 μm . Please note that at 5 μm the detection efficiency is 42% (please see 7th column of Table 2).

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Reviewer: -Figure 2: No need to repeat "%" symbol in the y-axis labels, this is already in the legend.

Response: If the Reviewer agrees, we would like to keep the % symbol in the y-axis for clarity.

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Reviewer: -Line 256: You mention the WIBS did not give fluorescence results because it "provides a maximum of two data points per excitation wavelength". This is difficult to understand for non-WIBS experts. Could you detail what prevent you from showing WIBS results here? This is a relatively big limitation of the paper, so this would deserve more explanation.

Response: We apologise that this section was not clear. We have changed the text to read as follows:

"Since the WIBS-NEO only detects signals in 2 channels (310-400nm and 420-650nm) a

maximum of two data points per excitation wavelength are obtained. One of these points is used to scale to the reference values, so only one value remains to evaluate the signal. No meaningful analysis is thus possible and no further assessment was performed for this device for fluorescence.”

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Response: We thank you for your time and valuable feedback.