

Interactive comment on “Development of a bioaerosol single particle detector (BIO IN) for the fast ice nucleus chamber FINCH” by U. Bundke et al.

Anonymous Referee #2

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General Comments.

A new detector presented in the current report is based on well-known principles, already successfully implemented in commercial sensors (e. g. TSI UV-APS 3314). Advantage of the current design is its low impact on the aerosol sample, major part of which should be available for further analysis. Undoubtedly, this detector will be useful addition to the suite of instruments on FINCH chamber; however creditable and useful results can be expected only after scrupulous calibration and characterization of the detector. Unfortunately, current report presents examples, impressions, and some circumstantial evidence, which is not sufficient basis for evaluation of capabilities, limi-

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tations, and practicality of the detector.

Specific comments.

2404/Abstract. It will be helpful if the abstract was focused on current work rather than on general discussion of state of IN research.

2405/29-2406/6. Any other compounds with similar fluorescent characteristics that could be a source of false signals? While NADH and derivatives may be good “bio-fluorophores”, it is not quite clear, at least for non-biological reader, if they are good markers for all airborne bio-particles. Or they are good indicators for bacterial viability only (see discussion in Hairston et al., 1997)? Please elaborate.

2406/17-2407/4. This description of the FINCH optical detector seems to be excessive; interested and inquiring reader is already referred elsewhere. However, it will be helpful if relevant features of the optical detector are just listed here; such as laser wavelength, filters used, beam size, particle size sensitivity or range, etc.

2407/22. Is light scattered on a particle at 35 deg. used for normalization? Obviously, this signal depends on optical properties of the particle, particle position inside the laser beam, etc. Please elaborate.

2408/15. Technically, flow rate in FINCH is about 60 LPM; it becomes 6 LPM after the virtual impactor.

2408/19. The test aerosol was composed of two kinds of particles of the same size - 10 μm . Why are the particles in question different? Is it possible to estimate and/or compare sizes of both particles from the scattered signal?

2408/22-2409/8. Please show “frequency histograms” in question. It would also be helpful to present scatter plot similar to Fig. 8.

2409/13. Comparison with Huffman et al., 2009 data seems to be nonsensical; 100 minute measurement with unspecified size range is being compared to 4 month data

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set obtained in a different large city.

2409/17-22. Please substantiate (hidden) assumption that fluorescent particles are the largest in the population.

2409/23-25. Another possible explanation is: because of beam misalignment the particle may have crossed one beam through the center and the other on periphery, hence the difference in the signals.

2410/5-8. Not relevant here because it is not a result of the current work.

2410/15. Percentage could be misleading since “coarse mode” is not specified and size estimate (3 μm) is questionable.

2410/Outlook. It is a bit surprising, that no tests, calibrations, comparisons with similar instrumentation are planned.

2410/20. Power ratings of the laser in the cited paper is 30 mW, while TSI data sheet for UV-APS (model 3314) lists UV laser as 80 mW at 355 nm; both values are much less than 250 mW of the current design.

2420/Fig. 6. Is beam misalignment (see the caption to Fig. 7) corrected here? Signals from depolarized channels for second particle show substantial difference – why? It is supposed to be spherical silica particle.

2422/Fig. 8. Which scattering channel was used here? There are 3 different markers and un-annotated thick line on the plot – any special meaning?

Technical corrections.

2404/20. Morris et al. 2008 is missing in the References.

2406/20. Subscript: P44/P11

2421/Fig. 7. Incorrect capitalization in “X-axis”; if “V” means “Volts”, then labels on plots should be corrected accordingly; 25 samples at 200 kHz is 125 μs .

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2422/Fig. 8. “Signal PM” and “Signal PD” are not referenced either in the caption or in the main text.

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