

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-209

Anonymous Referee #2

Referee comment on "Measurement of black carbon emissions from multiple engine and source types using laser-induced incandescence: sensitivity to laser fluence" by Ruoyang Yuan et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-209-RC1>, 2021

Review of: "Measurement of Black Carbon Emissions from Multiple Engine and Source Types using Laser-Induced Incandescence: Sensitivity to Laser Fluence" by Yuan et al.

The paper investigates the effects of laser fluence in laser-induced incandescence systems to quantify the mass concentration of non-volatile particulate matter emitted by several combustion systems. The goal of the study is very valuable and the results will help develop calibration protocols that are definitely needed.

General comments

- The LII community also uses the term nrBC (non-refractory black carbon), for example in atmospheric studies using the SP2 instrument. To allow for a better understanding between different communities, it would be valuable to discuss the terminology relations (nvPM vs. nrBC, for example) in addition to "soot" and "black carbon" already in the introduction. It could be also valuable to mention/discuss the SP2 approach, expected similarities, and differences in mass measurements, for example, etc.
- Maybe I missed it, but how is the fluence measured? The graphs are in a.u., and the authors talk about nominal fluence. I guess this is the fluence measured by some photodiode in the instrument itself. Is that correct? Is there any information provided on the calibration (linearity and slope) of these fluence values?
- I think a summary table with the optimal fluence ranges for the different sources would help in the future to provide a quick view of best operational conditions.

Specific comments

Lines 23-25: I find the following sentence a bit confusing, if an optimized and therefore constant (?) fluence is used, why would different fluence levels be used? Maybe the authors mean that in a range of fluence around the optimized value, the mass concentration is unchanged? "It was found that an optimised laser fluence can be valid for real-time measurements from a variety of sources, where the mass concentration was independent of laser fluence levels covering the typical operating ranges for the various sources."

Lines 190 – 194: Filter-based measurements can also be negatively affected by humidity.
Line 198: I guess the PAX operates at 870 nm, but what about the MSS? Also 870 nm?

Please clarify.

Line 199: Even with RI constant, the AAE might deviate from 1 somewhat, so the equivalence might not be perfect.

Line 200: What source was it? Also, how was the PAX calibrated?

Lines 258-260: Consider rewording the sentence to something like "A time-weighted normalisation (TN) method was used to account for scatter caused by any modest variations in the concentration of the source emissions". Also, why could one use the SMPS concentrations or the photoacoustic signals to account for source concentration fluctuations?