

## ***Interactive comment on “Development and validation of a CCD-laser aerosol detective system for measuring the ambient aerosol phase function” by Yuxuan Bian et al.***

### **Anonymous Referee #2**

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The manuscript presents a system for measurement of aerosol scattering phase function at ambient conditions. The principle and design of the system is briefly described. Results of lab and field test are also shown and compared with simulation and other measurements. The performance of the system seems to be very good.

I think it is a good idea, since the design is simple, easy to be applied, and would not cost much. Therefore I would recommend the publication of this manuscript in AMT if the questions below are well addressed.

Major comments:

1. The description of the data processing algorithm (section 2.2) is unclear and hard to

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follow. Especially for section 2.2.2, I did not really get how it works. Also, some information is not mentioned. For example, what is the time resolution of the measurement? Does it depend on the aerosol concentration? I suggest the author to re-organize section 2.2, providing more details, describing the data processing algorithm step by step, in a more logical way.

2. The evaluation of the measurement uncertainty of the presented system is missing in current manuscript. There are many possible sources which may add uncertainties on the phase function provided by the new system. For example, the relative angle between the laser beam and the optic axis of the camera might be not exactly as what you expected. Also, there is always ambient light influencing the signal. I suggest the author to add a new section discussing about all those possible uncertainty sources, and give an overall estimate of the measurement uncertainty.

3. the English language needs to be improved.

Minor comments:

Section 1: The background at the beginning of section 1 is very weak. I suggest the author to write a bit more about why the phase function is important.

In section 1 you listed many methods which can provide aerosol phase function. Are they widely applied? If not, why? What are the advantage and disadvantage of those methods? One can give very short comments on each method.

Last para in section 1: it is better to start with “in this paper, we propose. . .”. Otherwise it seems you are still talking about previous studies.

P3L17: the detective angle range can be expanded to 10-170.

P3L20: how do you measure the direction of the two CCD cameras? How do you ensure that they are pointing to the right direction?

P4L1: what is the typical exposure time?

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P4L2: I do not understand “the central axis of the signals from the scattering light is fitted in the program”. Explain it in detail or just remove it if it is not important for audience to understand the system.

Fig2: signal merging is missing in this flowchart.

P4L21: in extreme cases, e.g. heavy haze or fog, what is the uncertainty of assuming a tau of 1? Maybe one can give a threshold of visibility above which the uncertainty is negligible.

Section 3: Mie calculation was used to simulate the phase function at dry condition. Can you give an estimate of the uncertainty of the simulation? And I suggest the author to mark the uncertainties of measurement and simulation as error bars.

P6L25: I did not see “biomass burning” in figure 4.

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