

## ***Interactive comment on “Information Content and Sensitivity of the $3\beta + 2\alpha$ Lidar Measurement System for Aerosol Microphysical Retrievals” by Sharon P. Burton et al.***

**Anonymous Referee #1**

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The authors use the optimal estimation technique to explore the information contained in so called 3+2 lidar measurements in respect to particle properties. The approach to analysis is interesting and provides new insight in lidar data inversion. The manuscript is very well written and deserves to be published. The authors use for analysis a monomodal size distribution, and it definitely limits the results obtained. If they understand how to generalize this analysis for bimodal distribution, it is worth mentioning it in the conclusion. Technical notes I can't understand why the results of analysis depend on number density value. It is just scaling factor... Explanations would help. It is well known that number density is unstable parameter in retrieval, due to possible contribution of very small particles. In this way volume density is more stable. Probably authors

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should comment why they didn't consider volume in their analysis. Authors use DOF to quantify the information content. Still, as I understand, there is no direct relationship between DOF and error propagation. For example, DOF=4.5, is it good or bad? The same time even DOF=5 doesn't guarantee low errors of inversion. The comments would be helpful. p.7 ln.29 “channel-specific systematic sources (e.g. filter transmittance)” How can filter transmittance provide systematic error? p.8 ln. 16 “...as well as values of effective radius, effective variance, and single scattering albedo (SSA)....”. Table shows also the lidar ratio.

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