

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-172

Anonymous Referee #2

Referee comment on "Detection of Sulfur Dioxide by Broadband Cavity Enhanced Absorption Spectroscopy (BBCEAS)" by Ryan Thalman and Jaron C. Hansen, Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-172-RC2>, 2021

Thalman et al. present an investigation of the feasibility of the measurement of SO₂ by the IBBCEAS technique. I can get the novelty that this technique has never been reported in SO₂ measurement in the deep UV window, and the work firstly tested it. But I cannot recommend this version of the manuscript published in AMT. This paper, to some extent, looks like an experiment report with limited discussion about their results. The detection limit (0.6 ppbv) mentioned in the abstract is not obtained based on experiments but inferences, which is not acceptable. The measurement uncertainty of the technique is not mentioned and assessed. I encourage the authors to provide a more detailed characterization of this instrument and provide at least one field measurement test to show the advantages of IBBCEAS or its potential compared with the UV fluorescence method.

Major comments.

- Line 122, the LOD is obtained based on the measurement by Avanties? The plot of the time series of the baseline measurement should be presented rather than a value.
- The measurement uncertainties are not discussed in the manuscript.
- Field application should be added to prove the feasibility of this instrument.
- I believe the data used in Figure 6 was based on the time series from Figure 4, if the intercomparison measurement is conducted by 43c simultaneously, this plot can be revised as a scatter plot rather than used six average values. Even if the six points were used to do the intercomparison, the measurement error should be given.
- Why this instrument do not need the purge flow, are there some new designs of the construction of the cavity to protect the high reflectivity mirror, or some other reasons? Is the filter used in the experiment tests?

Technique comments.

- Line 29, second, and sec should be unified throughout the manuscript.
- Figure 1, all the lines should be colored in black except BrO.
- Line 109, how many hours rather than "several"?
- Line 106 lpm, please give the full name when first appear in the text.
- Why other absorbers like HCHO, BrO are not considered in the spectrum fitting?
- Line 120, so which one of the cross-sections is used in the instrument characterization in the following sections?
- Figure 3, please label panel (A, B, C)
- Figure 4, please delete ":".
- Line 127, the integration time of 2 seconds is not consistent with that mentioned in Section 2.2.