

## ***Interactive comment on “Improvements to a laser-induced fluorescence instrument for measuring SO<sub>2</sub>: impact on accuracy and precision” by Pamela S. Rickly et al.***

### **Anonymous Referee #1**

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The authors describe the further development of an SO<sub>2</sub> fluorescence instrument that has been described before. The improvements are of interest for the reader. Therefore, the manuscript is within the scope of AMT. However, the manuscript lacks in describing details and discussion of results and would benefit from a clearer description and discussion of results. There is little effort to bring results into the context of literature.

Detailed comments:

Line 44-64: The discussion of SO<sub>2</sub> emissions is rather confusing. The author should be clearer in the discussion of increases and decreases of emissions specifically which time and emission sector is referred to.

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Line 135: What is meant by "simpler design"?

Line 139: Why exactly can the system now be operated at 200kHz instead of 25kHz?

Line 144: What exactly is the reason why the laser linewidth is now narrower compared to the previous system?

Line 175: Please state the wavelengths for the stated absorption cross sections.

Line 208- 227: Does the calculation of FWHM takes the resolution of 20nm of the experimental set-up into account? Does this include the second red-shifted peak in the case of SO<sub>2</sub>? Was there an effort to de-convolute the spectrum taking these effects into account?

Line 235: Because the timing of the fluorescence detection becomes important in the discussion, this should be explained in more detail in the instrument description.

Line 237-240: The authors may want to make the point that not only fluorescence is required for an interference, but also that the excitation spectrum must be similar. The author may want to consider showing excitation spectra of the aromatic compounds in addition. There is no comparison about fluorescence and excitation spectra found in literature. This should be added.

Section 4: This entire section is rather confusing. The motivation for testing different bandpass filters should be made clear. Why are there only the results from one filter shown in Fig 7? A clear discussion of Fig 7 and conclusions with respect to the different filters is missing.

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