**Reply to Reviewer 2**

The authors would like to thank the reviewer for the positive feedback and for the constructive questions and suggestions.

It is well written manuscript.  However, there are something which may be better to revise.

1) There is an approach which detect all parameter of interferences simultaneously on the solid phase absorbance detection for gas analysis. This may be cited.  (Analytical Chemistry, 81, 4183-4191 (2019).)

**The authors thank the reviewer very much for this interesting paper. We have added the citation and added in the text some text to explain its relevance.**

2) It is not clear about the temperature.  Is this for sample gas, sensor , or whole system include sample gas?

**The temperature mentioned in the paper refers to the gas temperature. The text has been updated to make it clearer.**

3) Relative humidity may also be effects to the response. Did you concern about RH effects?

**This is a very interesting point, but in this work the authors have not looked at RH effects. OPEN FOR FRANCESCA**

4) "AE" is described in the main text.  But it was not explained in figure caption. It is better the figure can be understand separately.

**Thank you for noticing this. We have updated the captions to include a short explanation.**

5) It is better to put the basic sensor performance after the optimization. LODs, reproducibility, and response speed?

**The authors have developed the new metric described in the paper (Error Limited Accuracy) exactly to be able to quantify the Limits of detection (LOD) of this type of sensors. It should not be forgotten that all the results shown in the paper have been obtained by a very big number of measurements and therefore when we discuss the distributions of results, we discuss exactly LOD and reproducibility (by discussing how wide are the distributions of the results for the AE). In the paper mentioned by the reviewer in point 1) they estimate the LOD with the standard deviation of different measurements. We do the same by studying how wide the distributions are. Since we don’t have any information on the functional form of the distributions, we decided to give the worst possible results (by giving the maximum value of the Absolute Error in the distributions) instead of only the standard deviation. The response speed can be divided in measurement time (XXXX sec.) and then inference time (the neural network is almost instantaneous, and the response time on a modern computer is of the order of the ms). We have added some information in the text to make the above mentioned points clearer.**

6) Also the sensor resolution on the concentration should be shown. Because the tiny difference of the response by temperature was discussed.

**The sensor difference in response due to changes in temperature have been shown in Figures 2 and 3, while Figure 4 shows exactly the dependencies of the measured Phase Shift vs. the Frequency at various oxygen concentrations, as the reviewer suggested. The goal of the Figures was simply to give an idea to the reader of the kind of data that the neural network uses to be trained with. If the authors have misunderstood the reviewer, they apologies. In this case possibly more information would be needed to be able to answer more thoroughly.**