Response to Reviewer 2 Comments

Point 1: it would be important that authors give comparative numerical details of the sensitivity measurement of this sensor with respect to traditional methods.

Response 1: RF based method for measurement DI does not exists. Therefore, we compared our method with the capacitor method, which is one of DI measurement method [5]. The results are arranged in a table of sensitivity to DI. The manuscript is also updated accordingly.

Table 7. Sensitivity to DI. (a) The proposed RF method, (b) Capacitor method

(a)

Sample	DI	Resonant Frequency [MHz]	Sensitivity [100KHz/DI]
Cold CO	1132	7191.0	51.05
Tier3	1075	6900.0	
LEV3	1168	6788.9	11.93

(b)

Sample	DI	Voltage [mV]	Sensitivity [100mV/DI]
A	1131	2180	0.020
B	1087	2090	
C	1164	2230	0.018

Revised paper: Line (246)

At the end, we have performed a comparison of our proposed method with the capacitor method, which is one of the DI measurement method presented in [5]. The results are summarized in Table 7. The sensitivities of the proposed sensor are achieved by taking the ratio of difference in resonant frequencies (f_r) of the samples to the difference in DI values and listed in Table 7a. Similarly, sensitivities of the sensor in [5] calculated by taking the ratio of voltage difference of the samples to the difference in DI values and listed in Table 7b. It can be seen that the proposed sensor is better in terms of sensitivity to DI.

Point 2: it would have been desirable to test with other fuel samples (Figure 4), so that the sensitivity in the classification can be verified, when the BWs are below 30MHz.

Response 2: we have only 5 DI sample. Therefore, we have incorporated the suggestion of the reviewer and updated the following Figure 7 by including comparison with assumed sample. The minimum frequency separation of 18 MHz lies between assumed random sample and LEV3, which is possible to distinguish.

-Previous paper: Line (185)

The resonance separation of four samples is greater than 100MHz and the reflection coefficients are below -12 dB except Tier3 sample

-Revised paper: Line (171)

The reflection coefficients of the selected five samples of LEV3, Tier3, Euro4, Cold CO, Tier2 and one assumed sample (permittivity differ by 0.01 with LEV3) are shown in Figure 5 for frequency range from 6.6 GHz to 7.7 GHz. The resonance separation of four samples is greater than 100MHz and the reflection coefficients are below -12 dB. The minimum frequency separation of 18 MHz lies between assumed sample and LEV3, which is still possible to distinguish.

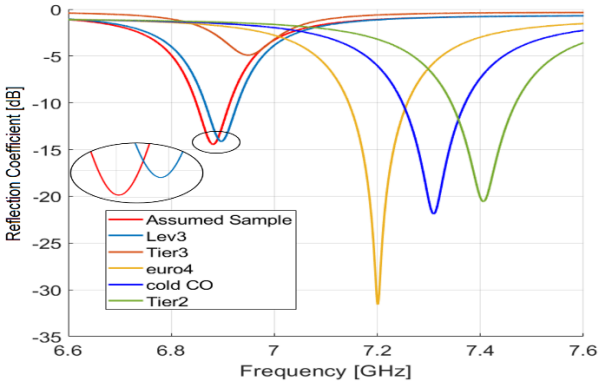

Figure 1. Simulation results of resonant frequency for different gasoline samples

Point 3: Figures 4 and 5 should be grouped. Are the same resonant modes what are measured in each case?

Response 3: The purpose of not grouping Figure 4 with the Figure 5 is because the samples of Figure 4 are being used in this study and the samples of Figure 5 are known commercial samples whose data are listed in Table 4 grouped with it. Also, same resonant modes are used for the all the simulations in each case.

Point 4: Another important aspect is to clarify why the study of the samples is done at temperatures of 0ºC and -35°C and next, the experimental measurement are carried out at 20°C. How is the validity of that result technically justified?

Response 4: Computer simulations are performed for 20ºC and experiments are performed from -35ºC to 0ºC

The reason of choosing 20ºC temperature is that the permittivity data taken from [26] gives permittivity values for different gasoline samples only at 20ºC. Therefore, the simulations performed in above Figure 1 correspond to this temperature.

In this paper, also HiDI gasoline samples are used, which are generally used in the cold areas. Therefore, measurements are taken at temperatures ranging from 0°C to -35°C. Reasons are also added to the revised version of manuscript.

- Previous paper: Line (189)

The minimum frequency separation of 31 MHz lies between Euro4 and Cold CO at 0°C temperature.

-Revised paper: Line (214)

The designed temperature range for the fuel tanks are between −40°C and 85°C [29]. Moreover, HiDI gasoline samples are generally used in the cold areas. Therefore, the measurements are carried out for the temperature ranges of 0°C to -35°C.

To justify the validity of these results, we have performed a quantitative and qualitative analysis between the theoretical and the experimental values of different gasoline samples.

-Section 4.2. Results and Discussion line (231)

The relationship between permittivity of different gasoline samples and resonant frequency is shown in Figure 12a where curve 1 shows theoretical values and curve 2 shows experimental values. The resonant frequencies of theoretical data are slightly higher than experimental values. The qualitative analysis of Figure 12a suggests that resonant frequency decreases monotonically with increase in permittivity in both curves. The experimental results are in agreement with that of theoretical results. Now, to perform quantitative analysis of the given data we define percentage error as follows:

Percentage Error = |Experimental values - Theoretical values| /Experimental values ×100

Figure 12b represents the percentage error between the theoretical and experimental values of resonant frequencies for various gasoline samples with different permittivity. The overall error is below 1.7%, which confirms the accuracy of the proposed sensor.