Response to Reviewer 1 Comments

We would like to thank the reviewer for your positive feedback and constructive suggestions on our Manuscript ID: nanomaterials-510144: “Guided mode resonance sensors with optimized figure of merit”. In the revision, we carried out extensive studies based on those feedback and suggestions. In the following pages, we list point-by-point response to reviewers’ comments.

For your convenience, we provide this MANUSCRIPT REVISIONS DETAILS with the reviewers’ comments in black. All responses made to the text are in RED color here.

REVISIONS DETAILS:

“This manuscript describes analyses of guided mode resonance sensors with a focus on optimizing the figure of merit for such devices. That is, the authors seek to identify trade-offs in design characteristics and sensitivity to optimize the figure of merit of the sensors, the ratio of the sensitivity to FWHM of the resonance.

The manuscript is interesting and potentially useful for researchers in the field. I’m pleased that the authors made the suggested changes. Overall the manuscript is improved, however there are still a few issues that should be addressed prior to publication.”

Point 1: In arriving at Eqn. 3 it appears that the authors are considering normal incidence only. This seems to be borne out in later figures but is not clear here. Is this correct?

Response 1: Yes, the reviewer’s thought is correct. We only considered the normal incidence, and we emphasize this point in the revise manuscript, as shown in Page 2, Line 89.

Point 2: Line 121/122 – The authors mention “extremely resonant linewidth” What is this supposed to mean? Perhaps you mean “extremely narrow linewidth”. What is the linewidth anyway?

Response 2: We have corrected this written mistake in the revised manuscript. The phrase “extremely resonant linewidth” is changed to “narrow linewidth of 0.016 degree”, as shown in Page 3, Line 125. The linewidth in this case is 0.016 degree.

Point 3: Line 134 – The authors state “…a shallow $d_g$ facilitates a narrow linewidth, but a relatively thick $d_{wg}$ (near 90 nm) also results in higher sensitivity.” This reads as if these are two separate things, but from what I can tell a shallow $d_g$ requires $d_{wg}$ to be relatively thick since $d$ is fixed; in effect, the constraint means that a relatively thick $d_{wg}$ facilitates a narrow linewidth and the shallow $d_g$ results in high sensitivity. This sentence needs to be clarified to make it clear that it’s not either/or, but one in the same.

Response 3: The sentence “a shallow $d_g$ facilitates a narrow linewidth” is owing to shallow grating depth will lead to smaller scattering of light, and thus more light is confined in waveguide region resulting a narrow linewidth. The sentence “but a relatively thick $d_{wg}$ (near 90 nm) also results in higher sensitivity” should be changed to “and a relatively thick $d_{wg}$ (near 90 nm) also results in higher sensitivity”.
This sentence is not only based on our calculation results, but also according to refs [35,46]. Ref [46] had verified that a shallow grating depth will make the linewidth smaller, and the sensitivity can be controlled by varying waveguide thickness shown in [35], and thus, we directly used these conclusions here.

**Point 4:** For the graphs in Figs. 1, 3, and 4 make the markers for S and FWHM different. They’re indistinguishable when printed in greyscale. To the same end, avoid referring to the curves/markers by color since the reader may be looking at a greyscale printout.

**Response 4:** Thanks for your advice. The S, FWMW and FOM in Figures 1, 3 and 4 (has been changed to Figure 5 in revised manuscript) have been changed to different symbols, and Figure 2 has also been changed for easy identification.

**Point 5:** Figure 1(i) – It’s great that the contrast has been improved on the text in this sub-figure, however the others are worse now; the text on (g), (h), and (j) are practically impossible to read, especially when printed out is greyscale.

**Response 5:** According to your advice, we have changed Figure 1 for easy to read. Besides, Figures 3 and 5 are also been changed for this purpose.

**Point 6:** Line 166 – “excellent” is a subjective term. Qualify this by making a quantitative comparison.

**Response 6:** The word “excellent” is changed to “higher”, as shown in Page 5, Line 172.

**Point 7:** Table 1 – The last line of refers to a device that is all grating and no waveguide. What does this even mean in terms of the device that is presented in this section? How can you model a grating-waveguide without a waveguide? I would remove this from the table.

**Response 7:** We have removed this redundant data in Table 1.

**Point 8:** Line 183 – “…much better…” quantify this as this term is subjective.

**Response 8:** The word “much better” is changed to “higher”, as shown in Page 7, Line 200.

**Point 9:** Table 2 – The same issue as above for the 50/0 configuration. You can’t model a grating-waveguide device if you don’t have a waveguide.

**Response 9:** We have removed this redundant data in Table 2.