

We thank the Reviewer for revising our manuscript. Here are their comments with a point-by-point response highlighted in red.

This is a theoretical investigation, building on the experimental investigation of Phys. Rev. Applied 16, 064024 (2021), Ref. [37]. The calculations are carried out with the COMSOL Multiphysics applications suite version 6.1.

I have to confess that this investigation is peripheral to my own interests and that I have not reviewed the first version of the manuscript. However, I have the impression that this is more on the level of routine work and thus more suitable for publication in SciPost Physics Core. After all, the physics is single-particle physics and the computations are carried out with a commercial program package.

REPLY: We thank the reviewer for taking the time to read and comment on our work, and we appreciate it even more knowing that this work is not directly in their area of expertise.

Regretfully, we disagree with most of the considerations put forward by the Reviewer. It has never been our intention to develop a theoretical method for the simulation of topological photonic crystals. A wealth of approaches, including FEM, have been successfully introduced in past literature. We thus apologize if our wording might have sound confusing, but the aim of our work is rather the proof-of-concept demonstration of a topological photonic crystal (and of a possible resonator device) completely based on industry-compatible group-IV semiconductors, which operates in a technologically critical field such as that of the THz. A similar concept has never been shown before and this is one of the key points that underline the significance of our manuscript.

It should be noted that to put our findings on a more solid ground, we decided on purpose to rely on robust and widely used FEM software. We strongly believe it inappropriate to regard the methodology and the specific simulation platform, rather than the actual findings, as a main motivation for a rejection.

Nevertheless, motivated by this comment from the Reviewer we decided to further polish the text to emphasize even more the value and novelty of our work. Therefore, we added the following sentences after the paragraph ending at line 194: "The resonator introduced in this work is an initial demonstration of a topological device utilizing group-IV semiconductors, which shows promise for use in high-quality factor emitters that are directly integrated into the Si platform."

There is one item concerning content that has been mentioned before (point 1 in Anonymous Report 1 on 2024-2-25), but in my opinion has not been properly addressed yet: The "Compressed" and "Expanded" unit cells of Figs. 2a) and c) are obviously equivalent in the bulk, and indeed the band structures of Figs. 2d) and f) seem to be identical. Accordingly, their symmetry groups must be isomorphic, i.e., only representations can differ. Of course, if one cuts the unit cells in different manners, the edge states can be different. Nevertheless, I find the comments on the bulk properties in Anonymous Report 1 on 2024-2-25 clearer than the corresponding discussion on page 5 of the manuscript. I thus recommend revisiting the discussion on page 5; first focusing on bulk properties and only in a second step introducing boundary states and topological properties might help.

REPLY: We thank the reviewer for the comment and apologize if the discussion reported in the manuscript about the 'compressed' and 'expanded' unit cells appeared to be incomplete to some extent. We added a paragraph further detailing the differences between the bulk and edge physics starting at line 137. We hope that the revised manuscript is now more precise and accurate, as we have further amended the text to include also these last remarks and suggestions from the Reviewer (see also our reply to point 1 of Reviewer #1).

Beyond this, there are some details that I recommend to address, see "Requested changes".

Requested changes

1- *The \cite commands after the punctuation marks are sometimes confusing; at least they look strange. While I admit that there seem to be no specific formatting instructions in this respect, I recommend moving the \cite commands before the punctuation marks.*

REPLY: To improve the readability of the manuscript we followed the suggestion of the reviewer and inverted the \cite commands and the punctuation marks throughout all the text.

2- *The inset of Fig. 1(c) is too small to be readable, at least in my printout. Enlarging the entire figure might help, but to play things safe, I recommend to also revisit the inset.*

REPLY: We thank the reviewer for pointing out that Figure 1 was not perfectly readable. We increased its size and changed the inset. We hope that such modifications improve the quality of the figure.

3- *Revisit discussion of "Compressed" and "Expanded" unit cells on page 5, acknowledging that they are equivalent in the bulk.*

REPLY: We have revisited this discussion, as requested.

4- *The graphs in Fig. 3b) suggest a small value of d/a , but I was not able to find the exact value. I recommend providing this information in the caption of Fig. 3.*

REPLY: While the value of $d/a=0.3$ was stated in the main text, we missed adding it into the caption of Fig. 3, and we thank the Reviewer for pointing it out. We have now added "($d=0.3a$)" in the caption of Fig. 3.

5- *Figure 3c) contains information that is again too small to be easily visible in a printout. SciPost has no limitation on the length of the manuscript. So, why not use the space it takes for a clear figure?*

REPLY: We thank the reviewer for highlighting readability issues. We changed the design of the figure as suggested.

6- Due to the multiple adjectives, I was not able to make sense of the "opportunistically spaced phased dipoles" on lines 189 - maybe reconsider a clearer formulation.

REPLY: We removed "opportunistically spaced" from the sentence.

7- Thanks to a comment on line 65, one knows that Fig. 5 belongs to Appendix A. However, Appendix A does not refer to Fig. 5. I recommend adding at least a short comment also at this place.

REPLY: We thank the reviewer for pointing out a missing reference to Fig. 5. We included it in Appendix A, by adding "Fig. 5 shows that" at the beginning of the phrase starting on line 213.

8- On lines 229-230 there is a reference to Figure S4, but that figure does not seem to exist.

REPLY: We appreciate the reviewer pointing out the typo, which has now been removed.

9- I found Fig. 8 a bit confusing since the horizontal axis is reset with each new k point. Maybe a graph with two panels would be clearer: one showing the number of iterations needed and another one the final error, both as a function of k .

REPLY: We changed Fig. 8 as suggested.

10- Ref. [16] lacks the article identifier *aat0346* and DOI 10.1126/sciadv.aat0346.

11- Ref. [35]: The "(80-.)" after "Science" looks strange to me.

12- Ref. [38] might be better readable without the URL (i.e., DOI should suffice).

13- The DOI for Ref. [43] is 10.1364/OE.27.016088 - please add.

14- Ref. [49]: upper/lower-casing in the chemical formulas in the title needs to be corrected, same for subscripts (e.g., "YbF₃" etc.).

REPLY: The typos and missing elements in the bibliography have been amended.