electronics

Review response

Response to Reviewer 2 Comments

Dear Reviewer,

We want to express our gratitude for your thoughtful review. Your comments have significantly enhanced the clarity and accuracy of our work.

In response to your comments and those of the other reviewers, we have significantly revised the article. The section describing antenna characteristics, requirements, and limitations has been substantially modified. A literature review with a comparative table was included. The obtained results have been detailed more precisely, and measurements of the entire RF-frontend chain have been added, along with a comprehensive explanation. The discussion has been expanded to delve deeper into the proposed structure's properties in the context of micro-Doppler signal reflection analysis.

To enhance readability, we have removed some references that disrupted the flow of the text and added more recent ones. We have also corrected typos, refined sketches, and improved graph clarity. Appendix A has been added to detail the requirements, limitations, and design features of the transmit section's amplifier chain.

The revision aims to address the core concerns of all reviewers and present the results more clearly and scientifically accurately. We have carefully considered any conflicting suggestions to maintain the article's structure and clarity.

Please find our responses to your comments below.

1. Comment

1.1. Reviewer

Mistakes that should be corrected:

- *S11 is reflection coefficient or return loss (with proper sign).*
- *"in the optical as well as radio-frequency domain" - consider domains in plural as optical and RF are together 2 domains.*
- *Figure 1 a.) I recommend to add some arrows to show better the TX and RX directions.*
- *Line 116-117: automotive avoiding systems.... maybe word 'collision' is missing. We do not avoid automotive, we avoid their collisions by radars.*
- *Line 153 and other places: LNA amplifier.... sounds 'LN amplifier amplifier'. Like after FET, we do not write FET transistor as T already means transistor. Similarly for LNA. Simply LNA (or low noise amplifier) recommended.*
- *Some acronyms are not resolved. E.g., UAV, ISM.*
- *Front-end is mostly written as 'front-end' in the paper, however 5 times it is written as frontend (also in the title). Uniform writing is recommended.*
- *Somewhere, e.g., in the introduction, it would be useful to explain the start/stop frequencies of the S-band and the X-band.*

1.2. Response to Reviewer

We appreciate the reviewer's thorough review and detailed comments. We have addressed all the identified errors according to the recommendations, as we fully agree with the reviewer's assessment.

2. Comment

2.1. Reviewer

Figure 3: TX and RX direction arrows recommended in the figure. Also I have a question regarding the RX branch. Usually BPF is also required. See e.g., Fig.1 a.) where 2 BPFs are inserted in the RX chain. Is BPF missing or there was no BPF applied? I suppose RX BPF is needed to reduce unwanted interference from other frequencies.

2.2. Response to Reviewer

Figure 3 has been updated with arrows to more clearly indicate signal direction. While a bandpass filter is typically used to eliminate unwanted harmonics that might interfere with unauthorized frequency bands, it's not strictly necessary in our case. Our narrowband antenna and circulator effectively suppress higher-order harmonics and subharmonics.

We appreciate the feedback regarding the inconsistency in the layout description. Chapter 4.3 has been completely revised to clarify the requirements for using a bandpass filter, or why it may be omitted from the measurement setup. Your comment has been carefully considered.

An excerpt from the revised manuscript:

The scattered signal was subsequently routed to the SIM-153+ mixer, alongside a reference signal sourced from the directional coupler. A -10 dB coupling was selected to ensure adequate LO levels while complying with industrial, scientific, and medical (ISM) region limitations, considering the signal levels and achievable antenna gain (effective radiated power). Although bandpass filters are commonly used in PIC systems to eliminate unwanted frequency components, their inclusion can be avoided by utilizing a highly narrowband antenna and a suitable circulator. In our specific setup, both components effectively suppress harmonic components by over 70 dB, rendering a dedicated bandpass filter unnecessary.

3. Comment

3.1. Reviewer

Paper mentions antenna directivity multiple times. As the substrate (Duroid) is given, that definitively has some loss. Maybe using Gain would be more accurate or more proper term. Is the simulation tool calculating Gain or Directivity for the microstrip patch antenna?

3.2. Response to Reviewer

Thank you for your valuable feedback. In response to your comment, the antenna description chapter has been revised to incorporate both gain and directivity, the latter of which was the primary design parameter. Additionally, the text, commentary, and measurement data related to the antenna directional diagram have been updated to reflect these changes.