Response to Reviewer 3 Comments

1. Summary

Thank you very much for taking the time to review this manuscript. Please find the detailed responses below and the corresponding revisions in the re-submitted files.

2. Questions for General Evaluation	**Reviewer's Evaluation**	**Response and Revisions**
Does the introduction provide sufficient background and include all relevant references?	Must be improved	
Are all the cited references relevant to the research?	Can be improved	
Is the research design appropriate?	Yes	
Are the methods adequately described?	Can be improved	
Are the results clearly presented?	Yes	
Are the conclusions supported by the results?	Yes	

3. Point-by-point response to Comments and Suggestions for Authors

Comments 1: The authors should summarize the advantages and disadvantages of introducing a discrete JFET.

Response 1: Thank you very much for your suggestion. We have added the advantages and disadvantages of introducing JFET according to your suggestion. The revised text is as follows:

The use of JFET not only reduces the noise of TIA circuit, but also reduces the performance requirements of operational amplifiers in the circuit. This makes it easier to select devices that meet aerospace requirements in engineering. However, the differences in the performance of JFET will cause the circuit performance and symmetry to be reduced. After screening and testing 60 JFETs, two JFETs with the most similar performance were select-ed for experimental testing. In addition, we have carried out domestic research work to avoid restrictions on purchase channels. (P8, L222)

Comments 2: The authors should compare their results with other groups, such as LPF ground testing.

Response 2: Thank you very much for your suggestion. According to your suggestion, we have added the description of LPF ground test results and LPF flight test results, and the revised text is as follows:

Ground test results and In-flight test results of LISA Pathfinder were 0.64aF aF/rtHz @10

mHz and 0.7 - 1.8 aF/rtHz @10 mHz, respectively[17,21]. Compared with the ground test results, there is still a gap, mainly due to the influence of the amplitude stability of the excitation signal. This paper mainly focuses on the optimization and testing of front-end circuit noise, and the optimization and analysis of excitation signal amplitude stability will be reflected in the subsequent articles of our team. (P14, L358)

Comments 3: P1 L23 "a reduction in capacitance sensing resolution"?

Response 3: I am very sorry that the meaning here is to reduce the capacitance sensing noise, so it should actually be an increase in the capacitance sensing resolution. The revised text is as follows:

Finally, an optimized TIA circuit and a superior transformer were utilized to achieve an increase in capacitive sensing resolution from 1.095 aF/rtHz @ 10 mHz to 0.84 aF/rtHz @ 10 mHz, while improving performance by 23% (P1, L23)

According to your comments, we have carried out professional English polishing to avoid the occurrence of such ambiguity.

Comments 4: P4 L136 "The simulated and analyzed...", shouldn't there be four curves in Fig.3?

Response 4: According to your comments, we have added the simulation curve of the transformer bridge impedance. (P5, L155)

Comments 5: Some mathematic symbols used in this manuscript are inappropriate, such as the impedance and the real part.

Response 5: Thank you very much for your comments, we have corrected the mathematical symbols in the whole article.

4. Response to Comments on the Quality of English Language

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5. Additional clarifications

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