10.08.2024

Subject: Response to Revision of TPEL-Letter-2024-06-0321

Dear Dr. Vivek Agarwal

Thank you for your letter and the opportunity to revise our paper titled "Narrowband and Wideband Dual-Mode Wireless Power Transfer System with a Single Transmitter". The revisions offered by the reviewers have been helpful, and we also appreciate your insightful comments. The letter has been improved by the reviewers' comments. We have included the response to the reviewer's comments immediately after this letter. The modifications and additions are highlighted in the main text. We deeply appreciate your consideration of our manuscript.

Kind Regards

Assoc. Prof. Ozan Keysan

Reviewer 1:

- **Reviewer Comment**: 1.How to define wideband and narrowband? In the reference [8], the wideband frequency ranges from 100kHz to 6.78MHz.
- **Response**: Thank you for your comment, and sorry for the confusion. Narrowband systems use closely spaced frequencies, likely within the same standard, while wideband systems use widely spaced frequencies, often within different standards. We don't use 100 kHz and 6.78 MHz as in [8] due to hardware limitations, but the modulation method can be applied easily to those frequencies as well. We have added an explanation for narrowband and wideband in the introduction part, which is highlighted in yellow, and we updated our frequencies to 100kHz and 1.19 MHz.
- **Reviewer Comment** 2.The frequency range of the relevant standards is [80kHz, 6.78MHz], but it was set to 19kHz to 480kHz in the experiment. I don't think it is reasonable. Besides, the dc output waveforms and the efficiency should be provided
- **Response**: Thank you for your comment. The experiment frequencies have been re-adjusted to 100 kHz and 1.19 MHz. The proposed method can be easily implemented at any desired frequencies by adjusting the fundamental and switching frequencies. Moreover, the new experimental results, including DC output waveforms and efficiencies, are provided in the experimental section (Fig. 10, Fig.11 and Table IV), highlighted in yellow.
- **Reviewer Comment**The interference of two channels should be analyzed, especially for the narrowband with near frequency.
- **Response**: Thank you for your comment. In narrowband operation, the frequencies are very close, making it challenging to prevent interference. Some papers mention using anti-interference compensation on the receiver side. Now, we have included a discussion and the effect of the interference in the manuscript, highlighted in yellow (Section III-B).
- **Reviewer Comment**: 4.What is the output regulation range compared to other modulation methods?
- **Response**: Thank you for your comment. We discuss the voltage gain of our proposed system and possible control methods in Sections III-C and III-D, highlighted in yellow.
- **Reviewer Comment**: 5. How to implement the power control ? What are the calculation timecontrol period, and communication delay ?
- **Response**: We did not close the loop to control the output, but a discussion about output regulation methods has been included now in Section III-D. The effect of communication delay is related to control loop frequency, which is suggested to be equal to at least the reference frequency of the proposed modulation method.

Reviewer 2:

- **Reviewer Comment**: 1.Add details of the experimentation process to help readers to reproduce the results.
- **Response**: Thank you for your comment. The details about the experimental setup are included in Section IV now.
- **Reviewer Comment**: 2.Author need to discuss the result section more about where it came from and other possibilities.
- **Response**: Thank you for your comment. The experimental tests are remade, and the com-

ments about the results are expanded considering your response in Section IV-B, highlighted in yellow.

- **Reviewer Comment**: 3.What is the maximum efficiency of power transfer for RX1 and RX2.
- **Response**: Thank you for your comment. The efficiencies for our operating points, which are about 75 %, are included now in Section IV-C and Table IV, highlighted in yellow.
- **Reviewer Comment**: 4.Is proposed technology depends on the mutual coupling coefficient, if yes, how the power transfer may affect the narrowband power transmission.
- **Response**: Thank you for your comment. The modulation method is not affected by loading and mutual inductance. Therefore, the excitation of the frequencies does not depend on the mutual coupling. However, the system output power depends on the mutual coupling, which should be considered in the coil and compensation design. We included the gain response of our WPT coils in Section III-B.

Reviewer 3:
Thank you for helping us enhance the paper with your comments.

- **Reviewer Comment**: 1.The picture and caption in Fig. 2 do not match well. The axes a) and b) mean the same thing, but it is difficult to understand the difference between the two pictures through the explanation in the caption. According to the caption in b), it is unipolar SPWM. So, does a) refer to the results for bipolar SPWM?
- **Response**: Thank you for your comment. Sorry for the confusion. The figure and comment have changed now and are highlighted in yellow in Section II-A. The proposed system controls the carrier and reference phase shifts together, so it is not either unipolar or bipolar SPWM.
- **Reviewer Comment**: 2.In Figs 7 and 8, is the FFT fundamental frequency of each band operation 100 Hz rather than 100 kHz?
- **Response**: Thank you for your comment. We changed the experimental result for new frequencies as 100kHz and 1190kHz for wideband operation and 951kHz and 1190kHz for narrowband operation. You can find new results in Fig.8 and Fig.9.
- **Reviewer Comment**: 3. According to Section 2. C and D, ma are 1 and 0.8 in narrowband and wideband operation, respectively. However, captions of Figs 9 and 10 in section 3.B describe ma values that contradict the explanation. Which one is correct?
- **Response**: Thank you for your comment. Sorry for confusion. We had some typos and changed them to make them consistent now.
- **Reviewer Comment**: 4.The phase difference theta R and C used in equations (6) and (7) seems to have been converted to pi R and C in the experimental verification figures in Section 3. Is there an intention?
- **Response**: Thank you for your comment. Sorry for confusion. We had some typos and changed them to make them consistent now.

Reviewer 4:
Thank you for helping us enhance the paper with your comments.

- **Reviewer Comment**: 1. Bassically, the proposed method is a magnetic inductive wireless power transfer.Hence, firstly, the authors should discuss the effciency compared with the magnetic resonant wireless power transfer.
- **Response**: Thank you for your comment. We introduced a new compensation system on the TX side that makes the system magnetic resonant, which increases efficiency. The efficiencies for different operating points have been added now in Section IV-C.

- **Reviewer Comment**: 2. Secondly, compared with other Dual-Mode WirelessPower Transfer System, the transfer efficiency and transfer capacity should be discussed as well.
- **Response**: Thank you for your comment. The efficiencies for different operating points have been added now in Section IV-C. The discussion about the transfer capacitiy (utilization ratio) has now been added in Section III-C, and a comparison has been made with other modulation techniques.
- **Reviewer Comment**: 3.Thirdly, how to get the maximium transfer power and efficiency.
- **Response**: Thank you for your comment. The maximum power transfer and efficiency depends on the coil and compensation design. To achieve maximum efficiency, the power factor should be selected as 1 at both frequencies and also the AC losses of the coils should be considered. By giving specific carrier and reference phase shifts, we can achieve maximum transferred power.