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Extended **Abstract**

Maximum Power Point Tracking of Wireless Power Transfer at Midrange Operation

Tanbir Ibne Anowar

ABSTRACT

In this paper, Wireless Power Transfer (WPT) is investigated into the midrange operation considering the 65 cm distance where the power transfer capability is still possible due to the optimum impedance matching. Load side and source side impedance matching network are established and an optimum coupling is found and varied in each of the distance to achieve maximum power transferability. A comparison is done to validate the mathematical explanation with proper physical experiment and measured data confirmed the improvement of +3dB at 60 cm distance between the load and resonator coil.

Keywords:

Critical coupling, Power transfer efficiency, Wireless power transfer, Mutual coupling

INTRODUCTION

The research on Wireless Power Transfer (WPT) technology began since the 1880s with the earliest experiment of WPT which was performed by Nikola Tesla . An alternating current of 50 KHz was adopted to lighten an incandescent at a distance in 1899. Since then the idea of Wireless Power Transfer (WPT) has been the topic of research for over a century. The development of WPT technology had been very slow for a long time, until 2007, Marin Soljacic whom from the Massachusetts Institute of Technology (MIT) got a new breakthrough. They use the power source of two meters away lit a 60W light bulb .This achievement promoted the development of WPT technology with a big step. During the past decades, with the rapid development of semiconductor and integrated circuit technology, the electronic devices came into our lives rapidly with a growing number of electric wires .These wires have seriously made our life in disorder. The safety and reliability of these wires become worse with longer duration of use. Besides, the frequency plug interface cans also shrinkage the lifetime of electrical equipment. Due to the limitations of the wired power supply, people began to look increasingly shift to wirel.

METHODS

A coupled resonance exhibits properties to transfer energy in a system to its maximum case for some certain frequency. A Strong Coupled Magnetic Resonance (SCMR) could deliberately transfer energy into the midrange when both transmitter (TX) and receiver (RX) are tuned to a single frequency. This type of transmission requires a continuous alteration of the induced magnetic field inside both TX and RX coils, thus AC transmission is introduced inside the TX and RX current coil. To maintain a resonant frequency, capacitors are considered both receiving and transmitting sides. So that, at resonant frequency all the power can be transferred as both TX and RX are resonating at the same frequency. 'Q-factor' determined for each coil must be high enough to consider a high transmission rate. In WPT, an efficient power transfer requires a matching network between the primary sources to load represents the equivalent circuit and the simple graphical explanation of WPT. ess power.

METHODOLOGICAL ROBUSTNESS

Load dependency using adaptive tuning is a real issue in electronics (due to a single device of capable of multi-load) Using a class-E PA, that is very sensitive to load changes and degrades efficiency dramatically. It is because the entire design issue will fall apart for slight changes of impedance (Figure 4(b)). Using Reflected Load Theory (RLT) to find impedance ratio transformation in WPT, a strong Impedance Matching Network holds the key operation to the primary and secondary sides for efficient coil power transfer. In this study, an L-matching network is also used both at the primary and secondary end for impedance matching .Moreover, whenever the coil separation took part, there was always an interruption of coupling coefficient which is then compensated. It is more likely the trade-off between the strong and weak coupling between kTX and kRX.

Tanbir Ibne Anowar
Stamford University Bangladesh,tanbir.iut@email.com

CONCLUSION

In this research, an entire WPT link is developed with the optimum tuning mechanism. Multi-coil resonators are employed to enhance the operation for higher distance. An experiment is conducted to prove the theory and its development. As we know that the coil separation will degrade the entire WPT link and hence the PTE and also the mismatch of impedance, alignment, and resonant frequency will create sub-resonance, the link development is considered under all these circumstances. In this paper, a system is brought under the optimum coupling mechanism at dynamic matching impedance whereas the resonant frequency kept fixed during the operation. The method introduced is developed and verified to enhance to PTE and distance of the multi-coil WPT link. Design guidelines considering optimum conditions are plotted using the equivalent circuit model and hence constructed during experiments. Here, the proposed method of using optimum coupling technique is served efficiently and all the empirical equations of optimum coupling values are developed by applying impedance matching principles for the optimal values of source and load resistances. The effect of coupling tuning is investigated which is conducted into two different multi-coil effects. It is simulated and verified theoretically first and proved with the experimental studies. Simulation results are in positive consent and well matched with the theoretical model. Experimental results have shown the proposed method increases the PTE up to 85% at original resonant frequency along with an extended operating range. Moreover, the proposed technique can successfully compensate the splitting of the resonant frequency and confirms adequate matching on both sides of the WPT system.

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Tanbir Ibne Anowar
Stamford University Bangladesh,tanbir.iut@email.com