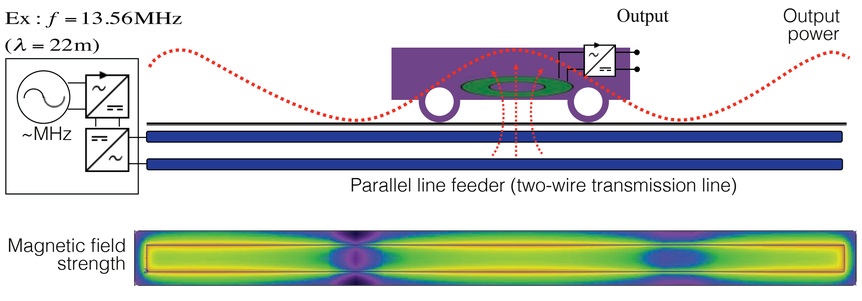
Inductive Power Transfer System Using Multiple Concatenated Parallel-Line-Feeder Segments

William-Fabrice Brou, Quang-Thang Duong, and Minoru Okada
Graduate School of Information Science, Nara Institute of Science and Technology,
Takayama-cho 8916–5, Ikoma, Nara, 630–0192 Japan

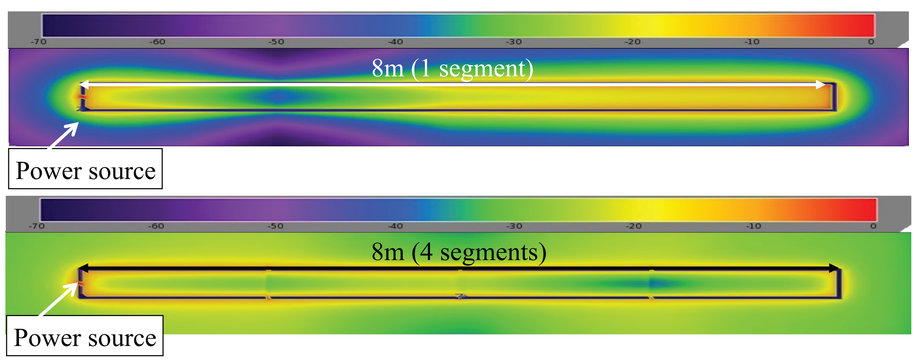
1. Introduction

Problem

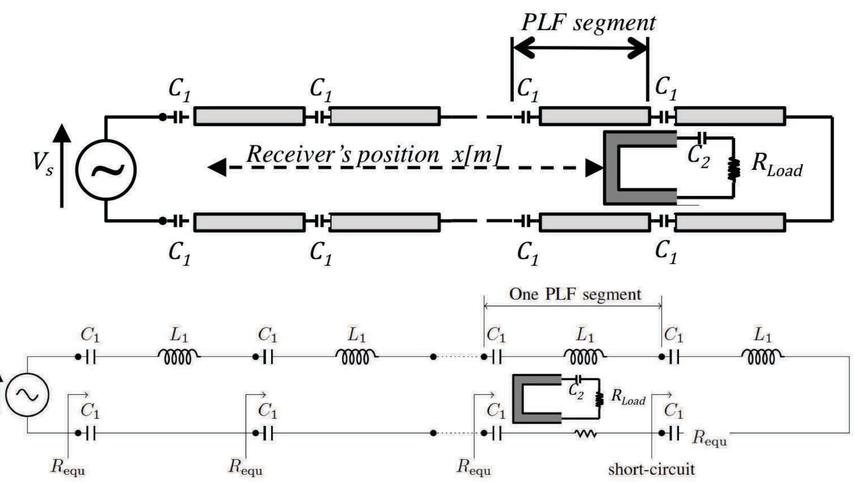


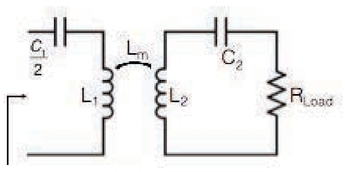
Standing wave → **Unstable output power, Lower efficiency**

Proposal: IPT system using concatenated parallel-line-feeder segments [1]



2. System model of an IPT system using concatenated PLF segments





$$R_{equ} = \frac{4\pi^2 L_m^2}{R_{load}}.$$

$$C_1 = \frac{2}{2\pi f L_1}. \qquad C_2 = \frac{1}{2\pi f L_2}. \qquad R_{equ} = \frac{4\pi^2 L_m^2}{R_{load}}.$$

3. Experiments

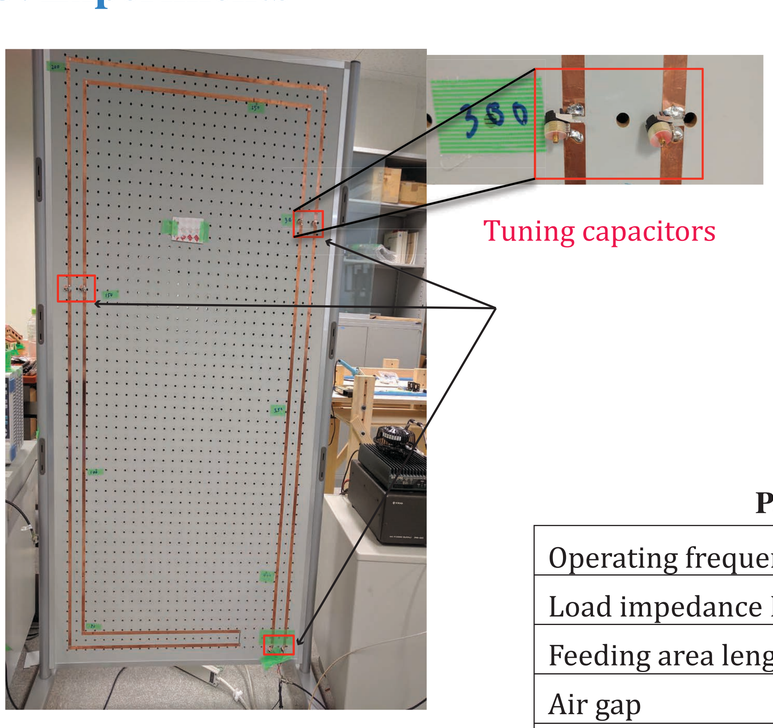


Fig. 1. Transmitter

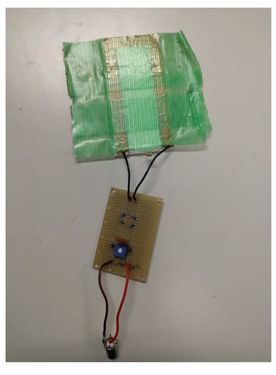


Fig. 2. Receiver

Parameters

Operating frequency	13.56 MHz
Load impedance Rload	100, 200 Ω
Feeding area length	$\lambda/4 = 4$ m
Air gap	2 mm
Tuning capacitor for C2	1000 pF

4. Results

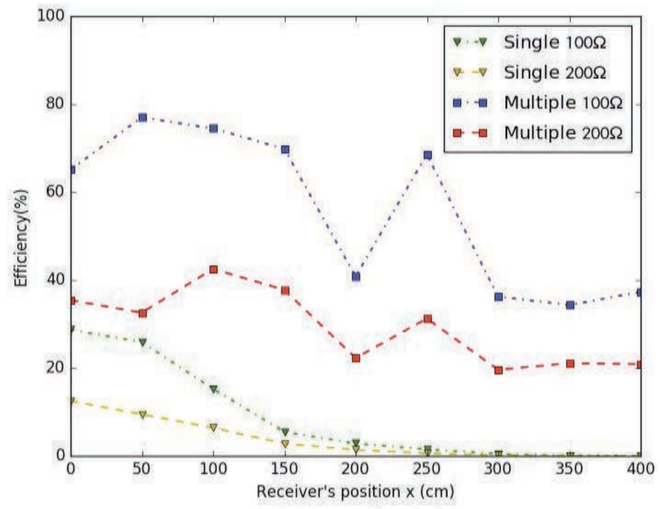


Fig. 3. Power transfer efficiency for single and multiple concatenated segments PLF system.

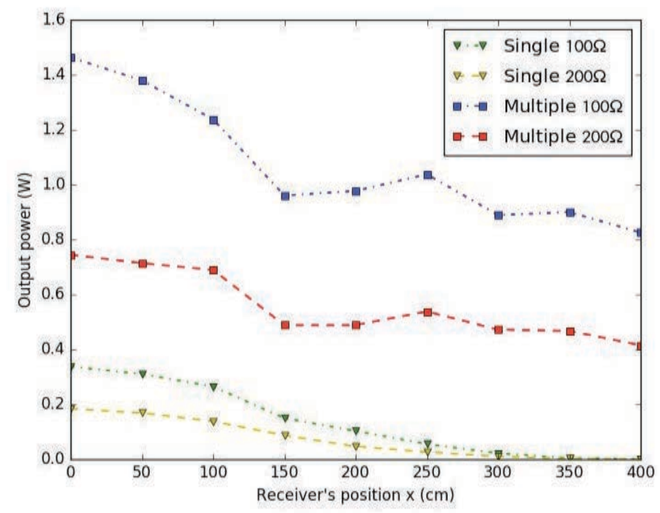


Fig. 4. Output power profile for single and multiple concatenated segments PLF system.

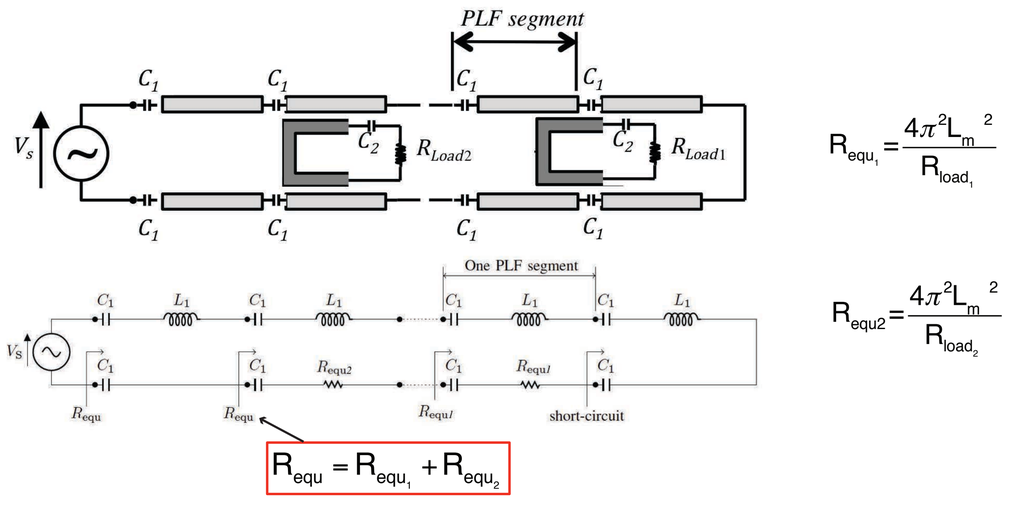
5. Conclusion

Much more stable against impact of standing wave leading to:

- Better power transfer efficiency
- High output power

6. Future works

- Dielectric loss
- Evaluate the proposed system for multi-receivers cases.



$$R_{equ_1} = \frac{4\pi^2 L_m^{\ 2}}{R_{load_1}}$$

$$R_{equ2} = \frac{4\pi^2 L_m^{\ 2}}{R_{load_2}}$$

References

[1] Q. T. Duong, M. Okada, "Inductive power transmission using multiple concatenated parallel-line-feeder segments," WPTC 2016, Portugal

Acknowledgment

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