Live Demonstration: An Optimization Software and a Design Case of A Novel Dual Band Wireless Power and Data Transmission System

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***Abstract*—Biomedical implanted electronic devices utilize inductively coupled coils for power and data transmission. To achieve efficient power transmission and high data rate, a dual band telemetry system has been proposed where different carrier frequencies can be used for power and data transmission, respectively. In this system, the physical parameters and geometrical structure of the coils must be carefully optimized to avoid the strong power interference to data transmission, which diminishes the advantages of multiple carrier frequencies. In this demonstration, an optimization procedure is introduced about the optimization of two pairs of coils based on an overlapping structure which minimizes power-to-signal interference in the data transmission. We applied the optimization procedure to a practical design case, and the results showed that our optimization procedure can achieve both optimal power transmission efficiency and high signal to interference ratio.**

I. INTRODUCTION

Biomedical electronic implants have been widely researched for a long time, and inductive link where power and/or data are transmitted using magnetic field is the most common means being used.Multiple band architectures for the purpose of achieve high data rate and high efficiency have been proposed by several groups. This demo is based on our previous work of a coil geometry where data coils are deliberately overlapped with power coils [1-2]. With the optimization procedure, such kind of systems can be optimized to achieve high power transmission and low interference.

Section II presents the results of the optimization procedure.

II. OPTIMIZATION PROCEDURE RESULTS

The design procedure is to find out the coil structure based on given certain application-specific design constraints by sweeping all the parameters of the coils. Here we present the proposed dual band system and its optimization procedure software. Figure 1 shows the user interface of this design tool. With this tool, dual band systems can be optimized to achieve high power transmission and low interference. Based on our procedure, we implemented an automatic program and applied this program to a practical design case, as shown in Fig. 1.

Figure 2 and figure 3 show the design case we will present during the demo session. In the example case, a power transmission efficiency of 69.8% and an overall Signal to interference transfer function ratio of 43.2dB have been achieved.

The demo will include software running on a laptop and a hardware setup including a coil stand and a few PCB boards. Power and data are wirelessly transmitted and a picture will be shown on a screen if both are successful. The audience can play with the software to see how the coils can be optimized. The audience can also play with the angles/distances between coils to see how they affect the power and data telemetry.

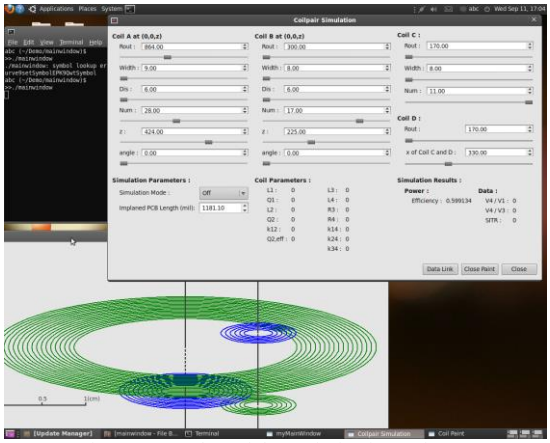

Fig. 1 Screenshot of the optimization software

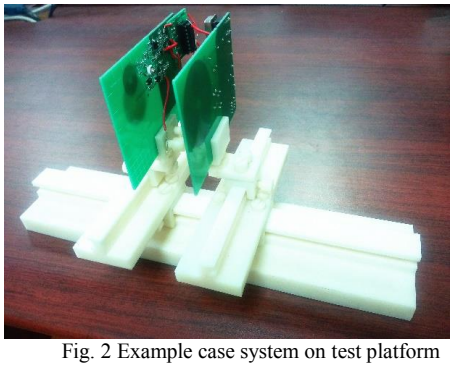

Fig. 2 Example case system on test platform

Fig. 3 Pictures recovered at 1cm and 2cm distance.

REFERENCES

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