Modeling and Optimization of aPlanar Omnidirectional Wireless Power Transfer System

Nowadays, wireless power transfer (WPT) is an emerging technology and the related market is booming, owing to the convenience that it can charge without physical contact. Portable devices such as mobile phones comprise a large proportion of the WPT market. However, the majority of the ongoing WPT products are directional and planar; although they can be easily carried or integrated, products can only charge in one direction. Some structures, like bowl, ball, or cube-shaped WPT systems are proposed to realize omnidirectional wireless power transfer. However, they suffer from inconvenience and integration problems. To address these problems, a planar omnidirectional wireless power transfer system is proposed. In Fig. 1, three sets of coils are designed to generate a magnetic field in three directions. By controlling the excitation current flowing through the three transmitter coils set, the total magnetic field can be directed in any direction.

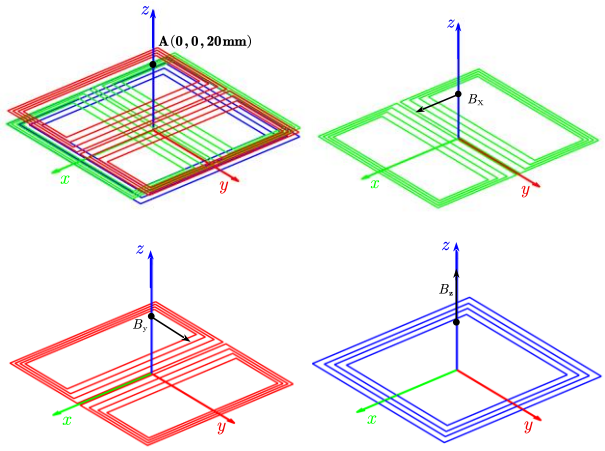

Fig.1. Proposed transmitter coil structure

The magnetic field distribution above the planar charging surface at different time instants is shown in Fig. 2. The omnidirectional field is induced in the region above the charging setup. Therefore, there is no need to align the receiver coil with the transmitter coil anymore. The transmitter can transfer energy in any direction and charging orientation freedom is greatly improved.

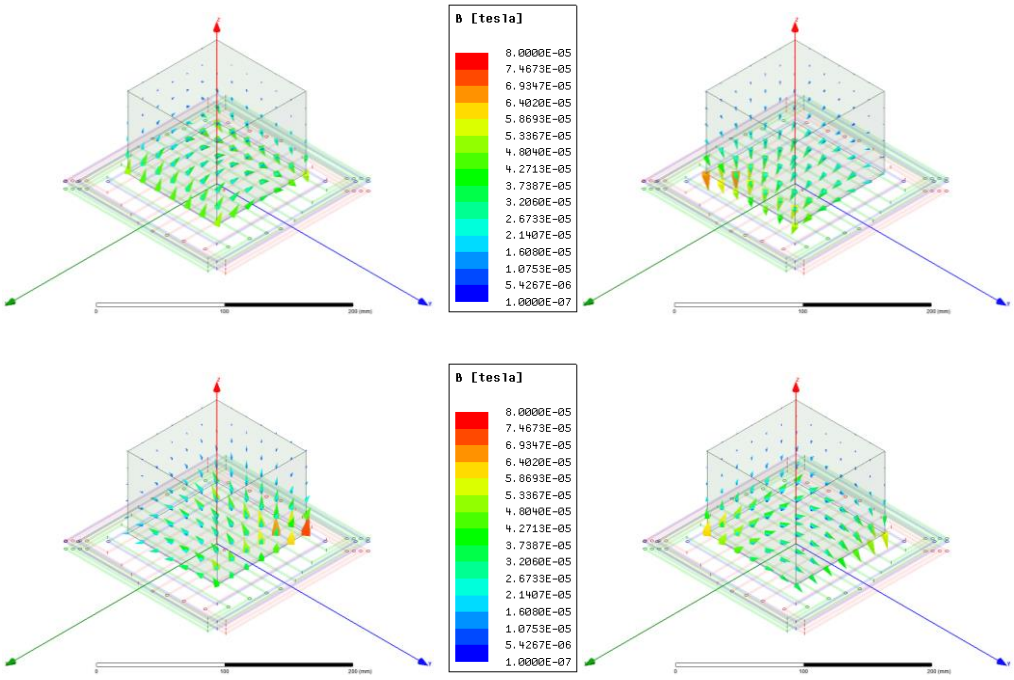

Fig. 2. The magnetic field distribution above the proposed transmitter coils structure