Wireless Power and Communications for Implantable Biosensors

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Abstract

Implantable biosensors have the potential to revolutionize the healthcare industry by allowing patients and their health care providers to continuously monitor blood pH levels, pCO2, proteins, metabolites, and a wide variety of other biomolecules. These devices need to operate completely wirelessly to be used for long term monitoring. Metal coils are attractive candidates for wireless power transfer and communications, since batteries take up a large amount of space and require surgeries for replacement. We have simulated and created planar coils at the millimeter scale to compare their performance for such applications. In this paper, we demonstrate how COMSOL Multiphysics® can be used to design and analyze these devices. There are three models that were used: one for inductance measurements, one for determining the power transferred between two coils, and one for determining the power transferred by a focused electromagnetic source. We discuss the trends that were revealed and how they are physically intuitive.