

Rectenna for Wireless Powering of Implantable Glucose Sensor

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Diabetes and pre-diabetes is becoming more and more prevalent issue as, according to the International Diabetes Federation (IDF), 415 Million people in the world live with diabetes in 2015. Expectations are that this number will grow to 642 million by 2040. In the United States alone, 29 million live with diabetes and 86 million live with pre-diabetes. The most common form of monitoring blood glucose levels for Type-II Diabetes is by means of pricking a finger and absorbing drops of blood into a glucose meter by means of a test strip. This method not only causes discomfort and pain to a diabetes or pre-diabetes patient, but does not have the capability to continuously monitor glucose levels for the edification of practitioners. However, another method of monitoring glucose, such as the GlySens ICGM system, is by means of an implantable glucose sensor which measures glucose levels and wirelessly transmits this data from the internal sensor to an external handheld display. While enabling diabetics and doctors to continuously and remotely monitor glucose levels, these systems rely on the presence of an implanted long-life battery. An alternative to these battery powered sensors, is a one that performs on a wireless energy harvesting. While current research has been conducted on an implantable glucose monitor can be wirelessly powered, these approaches have utilized coils for inductive charging. This paper presents an alternative method to providing wireless power to implantable glucose sensors by means of a microwave rectenna. This paper discusses the design, simulation, fabrication, and testing of a 2.4GHz ISM band rectenna for an implantable glucose sensor. The rectenna was designed to be implanted beneath 3mm thickness of skin and tested using tissue mimicking gels.