INTERFACING ELECTRONIC FOR MEASUREMENT, SIGNAL PROCESSING AND WIRELESS COMMUNICATION

Edited by

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Anis Nurashikin Nordin, International Islamic University Malaysia

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Chapter 4

WIRELESS TRANSFER OF LOW-POWER TO IMPLANTED BIOMEDICAL DEVICES: INDUCTIVE LINK DESIGN

IMRAN M. KHAN, AMINULLAH KHAN, SHEROZ KHAN, OTHMAN O. KHALIFA

Coupled coils do not act alone. They must be placed into the context of a circuit for effective operation both on the primary side and on the secondary side. The design of the inductive links is important as the Quality Factor (Q) of the two sides ensures that there is resonance at the desired frequency, and the power transferred is maximum. In this chapter, an inductive coupling from a sensor's electronic reader is analyzed to explore how it can be used for power transfer to the electronics of an implanted device. Extensive theoretical derivation is performed and simulated in order to place coupled coils into the context of an inductive link.

4.1. INTRODUCTION

In order for efficient power transfer to take place between coupled coils, they must be placed in the context of an inductive link. This means that the primary and secondary sides of the link must be properly designed and components selected so that there is resonance at the desired frequency and the quality factor of the circuit is high. This is why the design of the inductive link is crucial as it will impact the efficiency of the power transfer. One main aspect that needs to be considered while designing the inductive link is the type of load that is expected on the secondary side. The type of load can be resistive or capacitive depending on the type of sensor being used. While resistive sensors offer more linear readings, capacitive sensors are much more sensitive and allow for the measurement of very small parameter changes. Both of these types of sensors are considered in this chapter and the inductive link is designed.

4.2. COIL-COUPLED RESISTIVE TRANSDUCER

In the case of a normal resistive sensor or bridge that is powered by coupled coils (Fig. 4.1) it is not difficult to obtain the transfer function by reflecting the variable resistor to the primary side of the circuit.