Biomedical Demonstrator

Degree programme: BSc in Micro- and Medical Technology | Specialisation: Sensor
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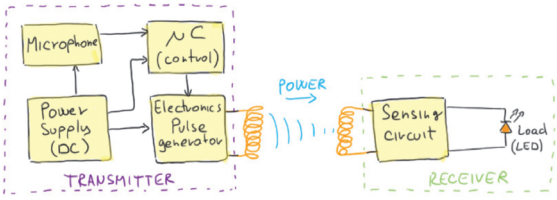
This work is carried out in collaboration with GlencaTec, a company specializing in glass encapsulation services. The goal is to create a demonstrator to show the advantage of the encapsulation technology to the customers.

Motivation

The main objective is to develop a demonstrator that shows that GlencaTec›s encapsulated products are of high quality, perfectly sealed and that it is possible to transmit radio frequency signals through the glass material. For this reason, a system based on Wireless Power Transfer has been designed. This system is capable of transmitting energy from a transmitter to a receiver. To demonstrate the operation of the encapsulated product the capsule is introduced into water or other environments and depending on the distance between transmitter and receiver it is also possible to figure out the absorbed power.

Principle

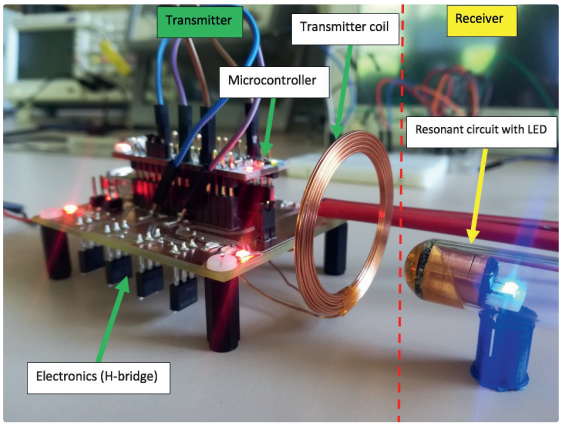
The operation is mainly based on a resonant circuit. Both devices (transmitter and receiver) of the inductive coupling must be set to the same resonance frequency to ensure high energy transfer. The transmitter›s electronic system is divided into control stage and power stage. Using a microcontroller, pulses are generated to create the resonance frequency in the primary circuit. A microphone is implemented with the microcontroller. Depending on the signal picked up by it, the LED may behave in a certain way (e.g. blinking, fading). A MOSFETs circuit manages resonance via an H-bridge configuration. In this way, a low power control is used to manage more energy in the load. The load is a RLC circuit where the coil creates a magnetic field and the capacitance allows resonance. The same principle also applies to the receiver. Nevertheless, the energy source to power up the LED is based on the energy consumption of the coil.



Basic diagram of inductive coupled system.

Results

The system obtained consists of a transmitter with a 40 mm diameter coil and a receiver with an 8 mm diameter coil. It has a pairing that is capable of lighting an LED at a distance of about 30-40 millimeters, depending on the type of LED and the environment. The primary system is enclosed in a material box that does not absorb magnetic energy. A microphone is implemented in the system as an additional attribute to create more advanced features for LED behavior. The entire system is powered only by a USB type A cable, which can be connected to any AC/DC converter. The energy supplied from the transmitter is between 10 and 20 Watts. These features allow for an easy-to-use product. For the company it is a demonstrator which will be able to attract customers and interested people, especially at a trade fair.



Prototype showing the operation between transmitter and receiver.

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