EGON –ACTIVE BACKSCATTER RADIO

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A new low power radio architecture based on a bi-stable regenerative transceiver with dissonant backscatter is investigated. A characteristic feature of the new technology is its ability to support communication with thousands of units simultaneously; further that each of these units consumes very little energy. This opens up vast application opportunities in the field of cooperating embedded systems. The goal of the project is to develop a radio design that, after further product development, enables the fabrication of active radio units with a battery lifetime of up to eight years and a price level in the same range as passive RFID tags.

1. Background and Motivation

Today the radio technology has been miniaturized to a level where a transceiver can be realized in the size of a couple of square millimeters. The next challenge is to design a radio that can be powered by an extremely limited energy source over a very long time period, and still keep the features of real-time coordination and control. The design of short range radio transceivers (operational range less than 100 m) leads into a part of the design space of radio transceivers that traditionally has not been considered in the context of low power consumption.

A typical application area is in logistics, where readers can communicate with electronic tags on the goods. These tags normally do not have a battery; therefore the embedded electronics is powered by the energy sent out by the RFID reader. This enables a low price and long lifetime of the tags. However, the sensing range is short, and when there is no reader in the vicinity, the tag cannot perform any actions (such as sensing, storing and processing data).

An active RFID system, on the other hand, uses tags that are powered by a battery source. These are readable at longer distance and can, e.g., sense and log the temperature of the goods. Thus, from a functional point of view, active RFID systems are superior to passive ones. The drawback is the higher price and the shorter lifetime.

2. Problem

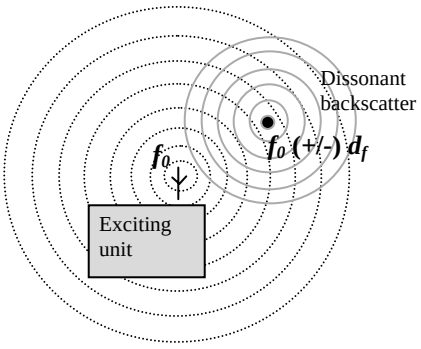
With the radio technology of today, a receiver (in devices such as mobile phones, headphones, and RFID tags) must be synchronized with the sender through a protocol, otherwise the receiver cannot differentiate the signal from noise. To keep the synchronization, the receiver must regularly receive data from the sender, and this consumes power. Solutions are needed that do not require synchronization.

3. Approach

The approach taken in this project is called “dissonant backscatter radio”. The radio architecture is based on low power oscillator circuitry.

In the new dissonant backscatter technology the interference generated by a regenerative receiver is used to backscatter information. This information fed back to the exciting transceiver can for example arbitrate specific devices. Furthermore, the self oscillation built up in the receiver is controlled in such a manner that self oscillation only occurs when an external RF signal is present.

A system based on the backscatter technology will have the following characteristics: extremely low current consumption in standby mode; a simple receiver design with small area footprint; and the possibility to address a large number of devices.



PARTNERS AND STATUS

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