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Extending the possibilities of radio frequency identification technology by new tag designs

Title of the dissertation
UHF RFID Transponder Antenna Solutions for Enhanced Performance and Producibility
Antenniratkaisuja UHF-taajuisten RFID-tunnisteiden suorituskyvyn ja valmistettavuuden parantamiseksi

Contents of the dissertation
Radio frequency identification (RFID) is a technology that enables the automatic identification of goods or e.g. people or animals over long distance. Using passive RFID technology at UHF frequency, on which this doctoral dissertation concentrates, identification ranges of up to ten meters can be reached. The identification transponder or the "tag" that is attached to the item to be identified is very simple, consisting of only an antenna and a microchip. This is possible, since the microchip obtains its energy, instead of a battery, from the electromagnetic field radiated by the reader device. The antenna of the transponder is, however, often the weakest link of the system. Metallic objects or e.g. people are challenging objects for RFID tags. They require antennas that are more complex than ones used for e.g. cardboard boxes or plastic objects. In order to equip various items with RFID, the tag also needs to be small. As bringing technology into new applications is often primarily a question of costs, additionally to size and performance, the producibility of the tags is of special interest in the thesis. In the thesis, the functionality of the presented solutions is demonstrated by fabricated prototypes. Additionally to small RFID tags that operate on various objects, the thesis studies new conductor materials in the implementation of RFID tags. Graphene is a printable and eco-friendly material, which can replace etching with toxic chemicals, which is the current main method of producing RFID tags. The thesis also introduces prototypes of transparent antennas that can be integrated into a window or a windshield of a car.

Field of the dissertation
Radio engineering

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Aalto University, School of Electrical Engineering, lecture hall AS1, Maarintie 8, Espoo

Opponent
Professor Manos M. Tentzeris, Georgia Institute of Technology, Atlanta, GA, USA

Custos
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A doctoral dissertation is a public document and shall be available at Aalto University, School of Electrical Engineering, Maarintie 8, main hall at the latest 10 days prior to public defence.