

Optimization of Energy Harvesting Systems for RFID Applications

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Abstract : To avoid battery assisted tags with limited lifetime batteries, it is proposed here to replace them by energy harvesting systems, able to feed from local environment. This would allow total independence to RFID systems, very interesting for applications where tag removal from its location is not possible. Example is here described for luggage safety in airports, and is easily extendable to similar situation in terms of operation constraints. The idea is to fix RFID tag with energy harvesting system not only to identify luggage but also to supply an embedded microcontroller with a sensor delivering luggage weight making it impossible to add or to remove anything from the luggage during transit phases. The aim is to optimize the harvested energy for such RFID applications, and to study in which limits these applications are theoretically possible. Proposed energy harvester is based on two energy sources: piezoelectricity and electromagnetic waves, so that when the luggage is moving on ground transportation to airline counters, the piezo module supplies the tag and its microcontroller, while the RF module operates during luggage transit thanks to readers located along the way. Tag location on the luggage is analyzed to get best vibrations, as well as harvester better choice for optimizing the energy supply depending on applications and the amount of energy harvested during a period of time. Effects of system parameters (RFID UHF frequencies, limit distance between the tag and the antenna necessary to harvest energy, produced voltage and voltage threshold) are discussed and working conditions for such system are delimited.

Keywords : RFID tag, energy harvesting, piezoelectric, EM waves

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