RFID

The RFID article is a 'work in progress' incorporating new information whenever time permits.

Radio-frequency identification (RFID)

1. Introduction; uses for security checks, including travel cards, and for purchases in shops; for monitoring personnel movement in hospitals, student campuses, etc; effects on people with RF sensitivity, pregnant women and their unborn children

2. RFID in hospitals; checking the whereabouts of expensive equipment; the downside of causing equipment malfunction; monitoring babies and blood supplies;

3. RFID Active Tags; Active tags more powerful, can transmit over several hundred metres

4. RFID Passive Tags; respond to signals from transmitters; very low power, transmit up to a few metres; found frequently in shops, libraries, etc.

5. Positive uses; can be used in accidents to transmit quick, accurate information to medical and other rescue teams

6. References; 4 papers

Radio-frequency identification (RFID)

RFIDs are small and cheap enough to be in everyday use in society, in everything from security and travel cards, such as London Transport's Oystercard, to anti-theft devices on goods in shops, and hospitals are starting to become aware of their potential.

RFID or radio-frequency identification is being used by companies to tag clothes, drugs, car parts, copy machines and even post, with chips laden with information about content, origin and destination. They are also equipping shelves, doors and walls with activating radiation coils and sensors that can record that data when the products are near. It would be easy to combine credit card data with information from the retail chips to know who bought what and when and conceivably track the product after it left the shop. Cordless phones, two way radios, local wireless networks, etc. can interfere with the signals. Although radio tag readers can identify 100 tagged items per second, radio waves have difficulties penetrating metals and liquids. These RFID tags are typically passive – they have no power source and are only activated when read by a scanner in close proximity. However it is now proposed, according to the BBC in a news report in May 2007, that the tags are part of a WiFi network in order to monitor the movements of people in hospitals, student campuses, etc. The battery-powered tags communicate with at least 3 wireless access points inside the network to triangulate a location. To do this, a wireless access point is needed typically every 30 metres. The information is sent back to the server and it then models the movement of the tag depending on the shift in signal strength detected. This will increase the amount of variable ambient radiofrequency radiation experienced by everyone within the network range.

However, lifesaving equipment in hospitals may be switched off by RFID devices used to track people and machines. RFIDs are used to help identify patients and reveal the location of equipment. At Heartlands Hospital in Birmingham, patients heading for the operating theatre wear an RFID wristband, so that even when anaesthetised, their full identity, including a picture, can be downloaded into a PDA held nearby. When testing whether the RFIDs might have an effect on equipment, in a total of 123 tests, 34 produced an 'incident' in which the RFID appeared to have an effect, 24 of which were deemed either 'significant' or 'hazardous.'

In some tests, RFIDs either switched off or changed the settings on mechanical ventilators, completely stopped the working of syringe pumps, caused external pacemakers to malfunction, and halted dialysis machines. Some 'hazardous' incidents happened when the RFID was more than 10 inches away. A study by Houliston (2009) found that electronic medical devices could fail in the presence of high-power RFID readers, especially if the device is tagged. Apparently they can be re-activated when the temperature increases. Once activated, they can set off alarms, until de-activated or removed.

A review by Foster & Jaeger (2008) said that *"The technology offers important health and nonhealth benefits, but raises ethical concerns, including privacy and the potential for coercive implantation of RFID tags in individuals."*

Some cities are already using active RFID tags embedded in car windshields to collect tolls automatically on bridges or highways as people drive by. This saves drivers having to slow down, stop, or fumble for the right change. Some "smart cards" used on buses, underground, and other forms of public transportation also contain RFID chips. As you touch your smart card on the reader, the card automatically debits your account with the cost of the journey.

There are over 140 different ISO standards for RFID for a broad range of applications. They can operate at low frequency (less than 100 MHz), high frequency (more than 100 MHz, and UHF (868 to 954 MHz).

RFID technologies are used in all aspects of everyday life, and expose people unselectively. This scenario could pose a potential risk for some groups of the general population, such as pregnant

women, who are expected to be possibly more sensitive to the thermal effects produced by EMF exposure. Results show that the maximum temperature increase of the foetus and of the pregnancy related tissues is relatively high (even about 0.7ºC), not too far from the known threshold of biological effects (Fiocchi 2014).

RFID in hospitals

Pieces of mobile equipment in hospitals can be very valuable items. Radio frequency identification (RFID) systems and WiFi across hospital campuses are being used to keep track of items such as wheelchairs, portable X-ray and ultrasound machines, etc. RFID systems can be either passive, where the tag needs a scanner, or active, where the tag transmits its location to the network.

In a controlled nonclinical setting, RFID induced potentially hazardous incidents involving medical devices. Implementation of RFID in the critical care environment should require on-site EMI tests and updates of international standards (van der Togt 2008).

Liu (2011) asserts that most hospitals do not understand or pay sufficient attention to the issue of RFID interference with patient safety or medical devices. In addition, most hospitals believe that the problem of RFID should be resolved by RFID vendors.

RFID Active Tags

RFID active technology in tags means they contain more advanced chips and batteries. They can send and receive signals over much greater distances.

Active RFID tags come in various shapes and sizes and offer a number of optional functions such as motion sensing, call buttons and temperature sensing. Active means the tag has an internal battery that powers the tag in order to transmit a frequent RF signal.

A network of readers placed strategically throughout the area to be covered receives the tags RF transmission. Active tags can be read up to several hundred metres depending on the environment and on the asset characteristics. Some tags use wireless access points as 'readers' while others use proprietary readers.

A study by H Yang (2015) recommended that an evaluation of the appropriateness of the current EMI measurement protocol should be made for this kind of device used by infants, because of the potential for interference with pacemakers.

RFID Passive Tags

Anti-shoplifting labels are called **passive** RFID tags. Instead of containing batteries, they work entirely by responding to the incoming radio waves from the doorway transmitter. There is just

enough energy in those radio waves to activate the RFID chip. Passive tags can send and receive signals only a few meters—enough to cover a doorway, but not much more.

Most Passive RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialised functions. The second is an antenna for receiving and transmitting the signal. The receiver must be within a few feet of the transmitting circuit to power up. Unlike active tags, passive RFID tags have no battery and require an external source to provoke signal transmission.

Passive tags are available in various formats depending on the application. They are being used in many industries for auto ID and security purposes. One such example is supermarkets and libraries for inventory systems to automatically sense when an item is being taken or returned.

Positive uses

"*An RFID chip implanted under your skin might save your life in an accident by transmitting your medical information to an emergency team. Doctors would simply wave a reader over your hand (or wherever the chip was implanted) to gain immediate access to your medical records.* "

In two simulated disasters, a passenger ship accident, and an aircraft crash in Finnish and Swedish weather conditions, the RFID prototype system was quick, stable and easy to use, even in harsh field conditions. It surpassed the paper-based system in all respects except simplicity of use. It also improved the general view of the mass-casualty situations and enhanced medical emergency readiness in a multi-organisational medical setting (Jokela 2012).

References:

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