



EPCglobal Information Paper on Health & Science Aspects of RFID

1. Introduction

Radio Frequency Identification (RFID) is the collective term for technologies that use radio frequency communications to remotely capture object identification data. It is composed of two main parts: the transponder (or tag) and the reader with its antennae.

Although the basic technology has been around for over 50 years, the use of RFID has increased dramatically over the last five years and is expected to increase at an even greater rate in the near future. Radio frequency communications transmit information over electromagnetic fields (EMF). EMF has been safely utilized by a number of technologies and in a variety of environments, including microwave ovens, mobile phones and overhead power lines. Consequently, studies, guidelines and regulations regarding health and safety of human exposure to EMF have existed for quite some time. As RFID becomes more widespread, questions regarding the safety of human exposure to EMF will naturally be guided by those studies, guidelines and regulations, and the organizations and government agencies that developed them on behalf of the public.

This information paper is intended to provide background information on EPC passive tags and reader technology based on the existing EMF studies, guidelines and regulations. This paper was written considering current EPCglobal standards and technology applications and will evolve as new standards and applications are developed.

2. RFID, health & science

Concern has been expressed that the radio frequency (RF) emissions from mobile phones and wireless computer connections (Wireless Local Area Networks or WLANs) may be harmful to the health of users and to the public. Similar questions have been asked about other wireless devices, including low-power short-range devices such as those used in RFID installations.

Although no peer-reviewed study deals specifically with RFID, there have been a number of studies carried out on portable wireless devices, which operate in the same frequency bands in which most RFID devices operate, including the frequencies utilized in the EPCglobal standards.

Evidence from those studies suggests that there is no correlation between those low power devices which operate at frequencies similar to those used in RFID installations, and known negative health effects. Another expressed concern is the potential future widespread use of RFID tags on products that may end up in the home. It is important to emphasise in this context that passive RFID tags do not emit RF energy; they simply reflect a very small percent (far less than one percent) of the energy from an RFID reader during the few seconds they are being read.

3. Existing rules and standards

The level of RF emission from RFID equipment must comply with limits established by various national regulatory agencies before the equipment can be placed on the market. The regulations for RF exposure limits that apply to cell phones, wireless remotes, WLAN and other wireless devices also apply to RFID systems.

These national regulatory limits are based on international standards such as recommendations from the World Health Organisation (WHO) or the American National Standards Institute (ANSI). The WHO standards refer to the limits provided by the International Commission On Non-Ionising Radiation Protection (ICNIRP) – the body responsible for determining RF exposure limits.

The EMF exposure limits already set by ICNIRP have significant built-in safety factors. These safety factors cover general variables such as exposure in severe environmental conditions (high temperature, etc), high activity levels, etc, as well as potentially more sensitive population groups such as the frail, the elderly, young children, etc.

EPCglobal takes health and safety concerns very seriously and advises its members to ensure that installations meet relevant regulatory guidelines and follow the ALARA principle –operate as “low as reasonably achievable” with good read accuracy.” For more information, see “[EPCglobal Recommended Occupational Use Best Practices on Complying with Limits for Human Exposure to Electromagnetic Fields](#).”

Industry requirements and EPCglobal commitment

All RFID products are required to be evaluated to ensure they conform to the RF emission safety limits adopted by the various regulatory agencies around the world. Equipment manufacturers must declare and demonstrate compliance before placing the product on the market.

Some regulatory agencies require the manufacturers to provide guidelines on proper installation and operation parameters to ensure compliance with the standards. The European Telecommunications Standards Institute (ETSI) and other standards bodies such as the International Telecommunications Union (ITU) have developed recommendations and guidelines for installing, testing, and operating wireless systems to ensure compliance.

As stated previously, EPCglobal takes health and safety concerns very seriously and advises its members to ensure that installations meet relevant regulatory guidelines.

4. Conclusion

The main conclusion from the international guidelines adopted by the WHO as well as from the results of the many scientific studies carried out to date is that:

EMF exposures below the limits recommended in the internationally adopted guidelines are not proven to have any known negative health effect.

5. Further Information

Should you require further information about EPCglobal’s position on issues relating to public policy, please visit the EPCglobal web site at: <http://www.epcglobalinc.org/> or email the EPCglobal Public Policy Steering Committee, best_practices@lists.epcglobalinc.org

6. Glossary of terms

ANSI	American National Standards Institute
ETSI	European telecommunications Standards Institute
ICNIRP	International Commission On Non-Ionising Radiation Protection
IEC	International Electrotechnical Committee
IEEE	Institute of Electrical and Electronic Engineers (USA)
ITU	International Telecommunications Union
RF	Radio Frequency
RFID	Radio Frequency Identification
WHO	World Health Organisation
WLAN	Wireless Local Area Network

8. References

- (i) The World Health Organisation (WHO) web site “Electromagnetic Fields (EMF) – Standards and Guidelines” at <http://www.who.int/peh-emf/standards/en/> states: “*The main conclusion from the WHO reviews is that EMF exposures below the limits recommended in the ICNIRP international guidelines do not appear to have any known consequence on health.*”
- (ii) ETSI 302 208 – “Electromagnetic compatibility and Radio spectrum Matters (ERM);Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W” at <http://pda.etsi.org/pda/AQuery.asp>
 - Part 1: Technical requirements and methods of measurement.
 - Part 2: Harmonized EN under article 3.2 of the R&TTE Directive
- (iii) ITU homepage at <http://www.itu.int/home/index.html> - most of the ITU documents used in the preparation of this information paper are restricted for the use of ITU members only.
- (iv) ICNIRP – “Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)” at <http://www.icnirp.de/pubEMF.htm>
- (v) ICNIRP – “Review of the Epidemiologic Literature on Radio Frequency and Health Environmental Perspectives” 112 (17): 1741-1754; Dec. 2004. <http://www.icnirp.net/pubEMF.htm>

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