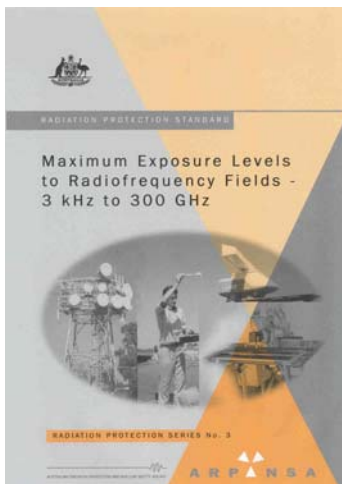




# The ARPANSA radiofrequency radiation exposure Standard



## Background

On 7 May 2002, ARPANSA published the standard: *Radiation Protection Standard - Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz* (in this and other factsheets referred to as 'the ARPANSA Standard'). The ARPANSA Standard sets limits for human exposure to radiofrequency (RF) fields in the frequency range 3 kHz to 300 GHz. The ARPANSA Standard also includes requirements for protection of the general public and the management of risk in occupational exposure, together with additional information on measurement and assessment of compliance.

## The Standard making process

The draft Standard was prepared by a Working Group of the Radiation Health Committee (RHC). The role of the RHC is to advise ARPANSA's CEO and the Radiation Health & Safety Advisory Council on matters relating to radiation protection, including formulating draft national policies, codes and standards for consideration by the Commonwealth, States and Territories, and to consult publicly in the development of policies, codes and standards.

In choosing the members of the Working Group, ARPANSA consulted widely with a range of organisations so as to achieve a spread of relevant expertise. There were also representatives with appropriate interests from the community, unions and the telecommunications industry. The Radiation Health & Safety Advisory Council was also consulted on membership of the working group.

The Working Group took as its starting point the draft standard developed by Standards Australia's TE/7 committee. In developing a standard in line with the latest scientific findings and world's best practice the Working Group considered any existing publications on related topics.

## How is the Standard structured?

There are five Sections and five Schedules in the ARPANSA Standard. The Sections define the exposure limits, compliance requirements and specifications for protection. The Schedules form an integral part of the Standard and contain the Rationale, exposure level look-up tables, power flux density graphs and compliance requirements for mobile or portable devices.

Furthermore, nine Annexes contain details of the fundamental science and information to facilitate the interpretation or implementation of the Standard.

Terms used in the ARPANSA Standard are defined in a Glossary.

## **Adverse health effects and the limits**

The ARPANSA Standard contains mandatory limits of human exposure to radiofrequency (RF) fields in the frequency range 3 kHz to 300 GHz. These must be applied in association with specified risk management practices.

The basic restrictions, are fundamental limits designed to ensure that known adverse health effects do not arise from exposure to RF fields. At the different frequency ranges, these basic restrictions are designed to prevent:

- electrostimulation of excitable tissue (3 kHz - 100 kHz),
- adverse effects arising from localised and/or whole body heating (100 kHz - 6 GHz),
- excess heating of skin or cornea for frequencies in the range (6 GHz – 300 GHz),
- nuisance auditory effects (300 MHz - 6 GHz),
- adverse effects associated with extremely high pulsed fields (3 kHz – 300 GHz).

Because direct assessment against the basic restrictions can be difficult, time consuming and costly, reference levels are provided as a way of ensuring that the basic restrictions are not exceeded.

Reference levels are defined by quantities that are relatively easy to measure directly and in general there is commercial equipment available to make such measurements.

## **Further content**

The ARPANSA Standard also includes:

- a comprehensive rationale, ie. statement of the underlying reasoning employed in the development of the Standard,
- review of epidemiological studies,
- review of bio-effects research at low levels of exposure,
- requirements for management of risk in occupational exposure and measures for protection of the general public,
- approaches to verification of compliance with the Standard, and
- the contact details of relevant regulatory and radiation protection authorities.

## **How were the exposure limits derived?**

The limits in the ARPANSA Standard are based on the 1998 guidelines of the International Commission on Non-Ionising Radiation Protection (ICNIRP) for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

There are some differences, however, between the ARPANSA Standard and the ICNIRP Guidelines. In establishing the Standard, ARPANSA has followed the original intent of the ICNIRP Guidelines. However, the ICNIRP Guidelines do not constitute a technical Standard and in some circumstances their application may be unclear. Further, it is necessary that various Australian regulatory bodies are able to readily interpret and implement the ARPANSA Standard. Consequently, some of the

ICNIRP specifications were modified to provide an unambiguous technical definition (such as the addition of limits for pulsed exposure).

## **Are adverse health effects at levels below the limits of the Standard possible?**

Significant safety factors are incorporated into the exposure limits – that is, the limits are set well below the level at which adverse health effects are known to occur. The Working Group developing the Standard reviewed research at low levels of exposure published since after the ICNIRP review to ensure that more recent research did not reveal problems. Furthermore, there is an extensive world wide research effort to investigate any adverse low-level effects. The research aims to address the World Health Organization's research agenda. However, if evidence of any adverse effects does come to hand, ARPANSA will certainly review the limits of the Standard.

## **Will the new limits change exposure levels from mobile telephones and their associated base stations?**

The specific absorption rate (SAR) is defined as the rate at which a mobile phone user absorbs energy from the handset. The ARPANSA Standard specifies exposure limits to RF EME for mobile phone handsets in terms of the SAR. In the ARPANSA Standard the SAR limit for mobile phone handsets is 2 watts per kilogram of tissue (averaged over 10 grams), replacing the old limit of 1.6 watts per kilogram (averaged over 1 gram). The increase in the SAR limit is a result of adopting the ICNIRP Guidelines.

The limit includes a significant safety factor with the maximum temperature rise in the side of the head for the level in the ARPANSA Standard being less than 0.1°C. Normal temperature fluctuations typically exceed 0.1°C.

*For further information see fact sheet 5  
'About mobile phones'.*

ARPANSA conducted measurements of RF EME levels at 14 locations near GSM mobile phone base stations during 1997-99. ARPANSA found that emissions from these antennas were usually many orders of magnitude below the limit of 450  $\mu\text{W}/\text{cm}^2$  set by the ARPANSA Radiation Protection Standard "Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz" for general public exposure. The levels measured were comparable to television and FM radio transmitters and considerably lower than those from AM radio transmitters, all measured at the same time. A detailed summary report (Line *et. al.*, 2000) of these measurements can be found within the ARPANSA web site at:

**[www.arpansa.gov.au./radiationprotection/factsheets/is\\_basestations.cfm](http://www.arpansa.gov.au./radiationprotection/factsheets/is_basestations.cfm)**

A further study of 60 base stations, including CDMA, GSM and 3G technologies, in 2003 confirmed that RF EME levels were well below general public exposure limits.

*For further information see fact sheet 6  
'About mobile phone networks'.*

(Revised: April 2008)

**Fact sheets in the EME series are:**

- Fact sheet 1: *Electromagnetic energy and its effects*  
Fact sheet 2: *Government action on electromagnetic energy public health issues*  
Fact sheet 3: *Australian research into EME*  
Fact sheet 4: *The ARPANSA RF Exposure Standard*  
Fact sheet 5: *About mobile phones*  
Fact sheet 6: *About mobile phone networks*  
Fact sheet 7: *What about using a mobile phone while driving*  
Fact sheet 8: *Potential interference of mobile phones with pacemakers, hearing aids and other devices*  
Fact sheet 9: *What about base stations and telecommunications towers - are there any health effects?*  
Fact sheet 10: *What about broadcast towers - are there any health effects?*  
Fact sheet 11: *Mobile phones and children*

For further information you can visit the ARPANSA web site at:

**<http://www.arpansa.gov.au>**