



Australian Government



Australian
Communications
and Media Authority

Mobile phones, your health and regulation of radiofrequency electromagnetic energy

communicating | facilitating | regulating

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This information has been prepared on the basis of substantiated research to explain the current thinking on this issue and some of the terms used are necessarily scientific. If anything is not clear, or you would like more information, contact details are provided at the back of this booklet.

The increased use of mobile phones in Australia and around the world has raised public interest in possible health issues associated with exposure to electromagnetic energy. People are concerned about possible harmful emissions from mobile phone handsets and base stations.

What is radiofrequency electromagnetic energy?

Radiofrequency electromagnetic energy (EME), also known as electromagnetic radiation (EMR), is waves of electric and magnetic energy moving together through space. EME is part of everyday life, emitted by natural sources like the sun, the earth and the ionosphere, as well as artificial sources such as:

- > mobile phone base stations
- > broadcast towers
- > radar facilities
- > remote controls
- > electrical and electronic equipment.

Radiofrequency EME is non-ionising radiation. This means that it is not able to directly impart enough energy to a molecule or atom to break chemical bonds or remove electrons such that the structure is changed. In contrast, ionising radiation (such as X-rays) can strip electrons from atoms and molecules. This process produces molecular changes that can lead to damage in biological tissue. It is important not to confuse the terms 'ionising' and 'non-ionising' when discussing biological effects of EME, because each type of radiation interacts differently with the human body.

What biological effects can be caused by radiofrequency EME?

A biological effect occurs when a change can be measured in a biological system after the introduction of some type of stimuli. However, a biological effect does not necessarily mean there is a biological hazard. A biological effect only becomes a safety hazard when it causes impairment to the health of the individual or of his or her offspring.

It has been known for many years that exposure to sufficiently high levels of EME can heat biological tissue and potentially cause tissue damage. This is because the human body is unable to cope with the excessive heat generated during exposure to very high levels of radiofrequency EME. Studies have shown that environmental levels of radiofrequency EME routinely encountered by the public are far below the levels needed to produce significant heating and increased body temperature.

At relatively low levels of exposure to EME—that is, field intensities lower than those that would produce measurable heating—the evidence for production of harmful biological effects is ambiguous and unproven. While there have been studies reporting biological effects at low levels, there has been no conclusive finding that such effects indicate a human health hazard, even with long-term exposure. In many cases, the studies have not yet been subject to scientific peer review or the results have not been replicated.

Is there any Australian research into the health effects of EME?

Since 1996, the government has provided ongoing funding of \$1 million per annum for the Radiofrequency Electromagnetic Energy (EME) Program. The EME Program supports research and provides information to the public about health issues associated with mobile phones and base stations, and other communications devices and equipment.

The three elements of the program are:

- > an Australian research program through the National Health and Medical Research Council (NHMRC) to conduct research into radiofrequency EME issues of relevance to Australia and to complement overseas research activities
- > continuing Australian participation in the World Health Organization's International Electromagnetic Field Project, to assess the health and environmental effects of EME exposure
- > a public information program; for example, fact sheets published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

What is the ACMA's approach to regulating radiofrequency EME?

The ACMA regulates devices such as mobile phone handsets at first point of supply to the market in Australia. This is done through applying the ACMA's mandatory standard and requirements for demonstrating compliance with the standard. Other transmitters are regulated through the ACMA's radiocommunications apparatus licensing system. In both systems, the compliance requirements become more onerous as the potential of the devices to exceed the limits of the standard increases.

For comprehensive information about the ACMA's regulatory approach to EME, see the following ACMA publications on the website at **www.acma.gov.au**:

- > *Human exposure to radiofrequency electromagnetic energy—Information for manufacturers, importers and agents of mobile and portable radiocommunications transmitters with integral antennas*
- > *Human exposure to radiofrequency electromagnetic energy—Information for licensees of radiocommunications transmitters.*

These publications are also available from the ACMA.

What standard is in place to protect consumers from the known effects of radiofrequency EME?

To ensure the Australian public is protected from the thermal effects of radiofrequency EME (and in light of the increasing use of mobile technologies), the ACMA made a mandatory standard setting human exposure limits—the Radiocommunications (Electromagnetic Radiation—Human Exposure) Standard 2003 (and its amendments).

The ACMA first made a mandatory EMR human exposure standard in February 1999. A revised standard in December 2001 extended the scope to all radiocommunications transmitters supplied with integral antennas and operating on a frequency between 3 kHz and 300 GHz.

The exposure limits of AS/NZS 2772.1(Int):1998 Radiofrequency fields part 1: Maximum exposure levels 3 kHz to 300 GHz, published by Standards Australia, was made mandatory by the 1999 and 2001 standards.

When AS/NZS 2772.1(Int):1998 expired as a current Standards Australia standard in April 1999, the ACMA asked ARPANSA to develop a replacement standard. ARPANSA is the expert Australian Government agency on radiation protection. In 2002, ARPANSA published the Radiation Protection Standard for Maximum Exposure to Radiofrequency Fields—3 kHz to 300 GHz (2002).

The Radiocommunications (Electromagnetic Radiation—Human Exposure) Standard 2003 replaced the 2001 standard and commenced on 1 March 2003. Its purpose is to:

- > make relevant EME exposure limits from the ARPANSA standard mandatory, in place of those from AS/NZS 2772.1 (Int):1998
- > generalise the application of ‘aware user’ provisions by defining an aware user device as one meeting certain technical and intended use criteria rather than one complying with certain product specific technical standards
- > make test methods mandatory for a wider range of products than the 2001 standard.

All manufacturers and importers of mobile or portable radiocommunications transmitters with integral antennas, such as mobile and cordless phones, as well as licensees of transmitter installations, such as mobile phone base stations, are required to comply with the exposure limits in the ACMA standard.

How does the ACMA monitor compliance with the EMR Human Exposure Standard?

The ACMA backs industry self-regulation with a compliance monitoring program that includes random audits and complaint investigations.

Manufacturers and importers of mobile phones, as well as licensees of transmitter installations, are given 10 days from when they receive written advice from the ACMA to provide documentation that demonstrates compliance with the EMR Human Exposure Standard.

The penalties for noncompliance include:

- > fines
- > seizure and forfeiture of stock
- > preventing the supply of products until non-compliance is corrected
- > prosecution.

Are there radiation emission limits for mobile phones under the EMR Human Exposure Standard?

Rather than emission limits, the EMR Human Exposure Standard specifies exposure limits to radiofrequency EME that regulate the rate the mobile phone user absorbs energy from the handset. This is known as the specific absorption rate (SAR)—the rate radiofrequency energy is absorbed by a specified mass of biological tissue—and is expressed in watts per kilogram (W/kg). SAR values are averaged over any six-minute period during a 24-hour day.

The exposure limits vary depending on whether the device is an aware user device or not. An aware user device is a handheld or body-worn transmitter intended for use such as:

- > a land mobile system station
- > an ambulatory station
- > a citizen band radio station
- > an amateur station
- > a maritime ship station.

For aware user devices, the exposure limits are:

- > for uniform exposure—0.4 W/kg whole body average SAR
- > for non-uniform exposure—up to 0.4 W/kg whole body average SAR, but with a spatial peak SAR not exceeding 10 W/kg as averaged over any 10 grams of tissue except for the limbs, hands, wrists, feet and ankles, where the spatial peak SAR must not exceed 20 W/kg averaged over 10 grams of tissue. (Generally, only compliance with the 10 W/kg spatial peak limit need be demonstrated).

For non-aware user devices, the exposure limits are:

- > for uniform exposure—0.08 W/kg whole body average SAR
- > for non-uniform exposure—up to 0.08 W/kg whole body average SAR, but with a spatial peak SAR not exceeding 2 W/kg as averaged over any 10 grams of tissue except for the limbs, hands, wrists, feet and ankles, where the spatial peak SAR must not exceed 4 W/kg averaged over 10 grams of tissue. (Generally, only compliance with 2 W/kg spatial peak limit need be demonstrated).

Are mobile phones safe?

The weight of national and international scientific opinion is that there is no substantiated evidence that using a mobile phone causes harmful health effects. Although there have been studies reporting biological effects at low levels, there has been no indication that such effects might constitute a human health hazard, even with long-term exposure.

Based on substantiated scientific research, and to protect the public from the potential heating effects of electromagnetic energy, the ACMA has implemented regulatory arrangements built on the mandatory standard setting human exposure limits to radiofrequency EME. The general consensus of scientific opinion is that, provided mobile phones do not exceed the limits of recognised standards, there will be no harmful effects.

Can the ACMA provide information about the EME exposure levels of different mobile phones on the market?

The ACMA does not hold information on the SAR measurements of mobile phone handsets on the market. However, the Australian Mobile Telecommunications Association (AMTA) has agreed to make information about mobile phones and health available to consumers. Under the agreement with the ACMA, the SAR values of mobile phones are provided voluntarily as part of the handset packaging. AMTA also provides information about SAR limits applicable in Australia on its website at www.amta.org.au (click on the SAR Information link).

If you would like to verify the SAR value associated with your mobile phone handset, the Mobile Manufacturers Forum (MMF) lists the SAR values of the most popular phones on its website at www.mmfai.org (go to Wireless Devices and then click on the SAR Information link).

While the specific power output and design of phones may vary from model to model, the rate energy emissions are absorbed from the handset by the user must not exceed 2 W/kg (averaged over 10 grams).

The ACMA conducts random audits to ensure manufacturers and importers are adhering to this limit and also conducts complaint investigations.

How does the EMR Human Exposure Standard apply to radiocommunications transmitter installations?

The ACMA standard is an exposure standard, not a technical performance standard. A technical performance standard specifies an emission limit; for example, a limit that always applies to field strength or power density at a specified distance from a radiator. On the other hand, an exposure standard or limit applies anywhere people may be located.

In general, for a transmitting facility (including a mobile phone tower) to be non-compliant with the ACMA standard, areas where levels exceed the public limits must first be accessible to the public in some way—accessibility is a key to maintaining compliance with the standard.

The exposure limit for transmitter installations is in Table 7, Appendix C of the ACMA publication *Human exposure to radiofrequency electromagnetic energy—Information for licensees of radiocommunications transmitters*. Licensees must block public access to areas where the exposure level from the installation surpasses this limit.

What can you tell me about the hazards of living near a mobile phone tower?

The weight of national and international expert opinion is that there is no substantiated evidence that there are adverse health effects resulting from the emissions of mobile phone towers or base stations. All mobile phone base stations must comply with the ACMA's mandated limits for human exposure to EME.

Generally, several base station antennas are mounted on a tower that is between 15 and 50 metres high, or on rooftops. When transmitting, these antennas typically emit a fan-shaped beam, roughly parallel to the ground. Because of the narrow vertical spread of the beam, the radiofrequency field intensity on the ground directly below the antennas is low. At the points that are accessible to the public, emissions are usually thousands of times below the level at which known health effects can occur.

Mobile phone towers are usually sited where the carrier considers they will best meet coverage requirements. If a site is placed further away from its optimal location, it may need to operate at higher power. Therefore, if a tower is close to an area of concern such as a school, the power at that area may be lower than if it was placed further away.

I was not warned about the installation of a mobile phone tower opposite my property. What regulations cover installation sites?

The ACMA regulations to protect the public from exposure to harmful emissions from telecommunications facilities do not set any distance requirements between the facility and other land uses such as residences, schools or hospitals. However, some local government authorities have determined additional conditions, such as distance, under their planning regulations.

Telecommunications carriers' responsibilities relating to siting of base stations and consultation are set out in the *Telecommunications Act 1997* and its subordinate legislation— the Telecommunications (Low-Impact Facilities) Determination 1997 (amended 1999), the Telecommunications Code of Practice 1997 and the Industry Code ACIF C564:2004 Deployment of Mobile Phone Network Infrastructure.

The Deployment of Mobile Phone Network Infrastructure Code (the code) was produced by the Australian Communications Industry Forum (ACIF), now Communications Alliance Ltd. The code covers the steps telecommunications carriers must take when deciding where to place a radiocommunications facility such as a mobile phone base station.

Under the code, a precautionary approach to the siting, design and operation of radiocommunications infrastructure should be adopted by carriers. It is a mandatory requirement under the code for carriers to notify councils about all facilities and their planned consultation procedures for installing low-impact facilities at new sites.

The code recognises that, while current scientific findings suggest there are no health effects associated with exposure to low-level radiofrequency EME emissions such as those from mobile phone base stations, some people are still concerned.

Under the code, carriers must consider the sensitivity of locations such as schools and hospitals and balance these concerns with other factors, such as coverage objectives, when deciding where to place a site. The code also requires carriers to take into account a list of objectives, including minimising EME emissions, in the design and operation of mobile phone towers.

More information about the Deployment of Mobile Phone Network Infrastructure Code is on the ACMA website at www.acma.gov.au, including a comprehensive set of frequently asked questions and related fact sheets (see **More information**).

How many radiocommunications facilities are in my local area?

All radiocommunications facilities, including mobile phone antennas, must be licensed by the ACMA. The ACMA maintains a register of radiocommunications licences. The register lists radiocommunications facilities that are operational. If a facility is currently being installed, it is unlikely to appear on the register. Most carriers forward their registrations to the ACMA in batches at regular intervals and the register may not list all radiocommunications facilities current at any particular time. For large searches, it may be easier to purchase this database on CD-ROM, which is available from the ACMA (see **More information**).

A national site archive has been developed by the communications industry to improve access to information about the deployment of mobile phone infrastructure across Australia. The archive contains information about most mobile phone towers deployed by carriers and includes information such as EME reports about a particular communications facility. The archive is at www.rfnsa.com.au/nsa/index.cgi.

More information

For more information about radiofrequency EME and health effects:

- > visit the World Health Organization website at **www.who.int**
- > see the ARPANSA fact sheets at **www.arpansa.gov.au**
- > see the ACMA website at **www.acma.gov.au**

For more information about EMR regulations:

- > see the ACMA's Human Exposure to Electromagnetic Radiation page
- > see the ACMA's mobile phone towers and EME website
- > contact the ACMA's Radiocommunications Licensing and Telecommunications Deployment Section, Operations Branch, on telephone 02 6219 5555, fax 02 6219 5347 or email **emr.issues@acma.gov.au**.

To access any referenced documents, go to the ACMA website at **www.acma.gov.au**.
