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FACTsheet

Electromagnetic energy and 3G mobile phones

Mobile phone carriers are introducing third generation (3G) mobile phone networks into Australia. In addition to the services supported by other mobile networks, 3G networks support video calls. The introduction of these networks has led to concerns about the potential health effects of electromagnetic energy (EME) produced by 3G transmitters, including base stations and handsets. EME is also known as electromagnetic radiation (EMR) or electromagnetic fields (EMF).

This fact sheet explains what is known about the effects of 3G EME emissions on human health and what is being done to protect the health of the Australian community by regulating these emissions.

EME emission levels from 3G base stations

Radiofrequency emissions from radio broadcast antennas have been present in Australia and around the world since the 1930s. The radiofrequencies used by mobile phone networks, including 3G, have been in use since the 1940s for purposes such as radar, radio links and microwave heating. In Australia, 3G networks operate in the 2100 MHz frequency band.

The EME emission levels produced by 3G transmitters are considered low, with an average radiated power of around 3 watts. This is significantly lower than the power levels of some other common types of transmitters, such as two-way radios used by taxis and emergency services. For example, a 3G mobile phone base station antenna radiates a little more than one-tenth of the power of a taxi's two-way radio.

The reason for the low antenna power is that the 3G network has been enhanced through the use of smart technology and improved network design. Radiated power levels are further reduced by the use of adaptive power control—a technology that continually adjusts radiated power levels to the lowest level necessary to obtain adequate radiocommunication.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has a responsibility for protecting the public and the environment from harmful effects of radiation, including EME. An ARPANSA survey of thirty-five 3G mobile phone base stations in five states confirmed that EME levels were lower than from other types of base stations and much less than 1 per cent of current standards. In many cases the levels were similar to, or less than, levels from radio and television transmitters.

In 2003, the former ACA introduced new limits for human exposure to EME from transmitters such as mobile phone base stations, based on a standard developed by ARPANSA. The limits are set out in the *Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz*, and are based on the most recent scientific data available. They incorporate significant safety margins and are set well below the emission levels that have been shown to have health effects. All mobile phone transmitters and antennas in Australia must comply with these limits. The exposure levels are measured in microwatts per square centimetre (abbreviated as $\mu W/cm^2$). One µW is a millionth of a watt.

The exposure limit for radiofrequency EMR from 3G base stations is 10 W/m2 or 1,000 µW/cm2.

Maximum exposure levels measured adjacent to mobile phone base stations vary depending on the height of the antennas and the number of services on the tower or building. Levels are usually less than 1 $\mu W/cm^2$. Beyond about 100 to 300 metres, the exposure levels decrease with increasing distance from the base of the tower.

EME emission levels from 3G handsets

Handheld 3G transmitters such as 3G mobile phones operate at lower power levels than both GSM handsets and CDMA handsets. The maximum power from a 3G phone (2100 MHz) is 0.125 watts produced over a 5 MHz bandwidth, whereas GSM phones (900 and 1800 MHz) emit an average power of 0.25 and 0.125 watts over a 0.2 MHz bandwidth and CDMA handsets (800 MHz) have a maximum power of 1 watt. With adaptive power control technology, 3G handsets operate at the lowest power necessary for good radiocommunications.

All mobile phones used in Australia must comply with the ACMA's Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2003. The standard specifies exposure limits to radiofrequency EME to regulate the rate at which the mobile phone user absorbs energy from the handset, known as the specific absorption rate (SAR). Mobile phone handset

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manufacturers provide SAR information in product manuals or a separate brochure with all new handset models released in Australia.

The SAR limit for mobile phone handsets is 2 watts per kilogram of tissue (averaged over 10 grams).

Relevant research

The weight of national and international scientific opinion is that there is no substantiated evidence that exposure to low level radiofrequency EME causes adverse health effects. This view has been backed by every major review panel, including the Royal Society of Canada (1999), ARPANSA's RF Standard Working Group (2002) and, more recently the updates by the review panels for the Independent Expert Group on Mobile Phones (2004), the French Health General Directorate (2004- 2005) and the Health Council of the Netherlands (2005).

This view is also supported by the World Health Organisation (WHO). In response to public concern the WHO established in 1996 the International EMF Project to assess the scientific evidence of the possible health effects of exposure to EMF in the frequency range from 0–300 GHz. The WHO continues to monitor the research and the results.

Research is continuing in many countries into biological effects of EME and possible effects on health arising from EME exposure ARPANSA will continue to monitor the results of this research and the reviews made by national and international bodies and will review the standard in the light of significant new evidence.

What is the government doing?

Since 1996, the Australian government has provided $1 million a year for the EME Program, which supports research into health issues associated with mobile phones, base stations and other communications devices and provides information to the public about these matters. The program was established in recognition of public concern and the need to ensure standards and public health policies continue to be based on the best available scientific information. Several research projects into the biological effects of EME have been funded through the program.

In 2004 the Australian Centre for Radiofrequency Bioeffects Research (ACRBR) was established to coordinate the EME research performed by five Australian institutions as well as overseas affiliates. ACRBR aims to foster a better understanding of the biological and health effects of human exposure to radio fields. Other studies into the biological effects of EME emissions have been conducted in Australia and overseas. The ACMA regularly monitors overseas regulatory developments regarding EME emissions and reviews EME codes and standards accordingly.

The ACMA's human exposure standard, first introduced in 1999, has been revoked and replaced twice, to increase the scope of the standard and to align it with recent scientific developments regarding EME emissions. The ACMA's EME regulatory regime is one of the most comprehensive in the world.

The ACMA has adopted a precautionary approach to the regulation of EME emissions, ensuring that emission limits on communications transmitters are stringent and lower than those levels that have been found to cause adverse health effects. The emissions produced by radiocommunications transmitters are generally thousands of times less than the exposure limits required by the standards.

In July 2003, ARPANSA established an Electromagnetic Radiation Health Complaints Register, a national database enabling people who believe they have suffered ill-effects as a result of exposure to EME to lodge a written complaint. ARPANSA will use the complaint information to:

- help identify future areas of research regarding the health effects of electromagnetic fields on people and the environment; and
- prepare and publish statistics for the information and use of the Australian Government and the public on the nature and level of complaints reported to the register.

Base station audits

From 1997 to 1999, ARPANSA conducted tests to measure the radiofrequency EME levels at GSM mobile phone base stations in 14 different localities, finding that emissions were usually many times lower than the allowable limits.

In 2003, ARPANSA completed an audit of EME levels around 60 mobile phone base stations across Australia. Preliminary results confirm the low levels found in overseas audits and the 1999 ARPANSA base station survey, which showed that the EME levels are very low. A comprehensive analysis of the audit will be published on the ARPANSA website. A conference paper summarising ARPANSA's findings from this audit program is at www.arpansa.gov.au/pubs/emr/2003survey.pdf.

More information

Information about EME regulatory arrangements is on the ACMA website. You can also contact the ACMA by email to emr.issues@acma.gov.au, by calling (02) 6219 5347, or by mail to the Radiocommunications Licensing and Telecommunications Deployment Section at PO Box 78, Belconnen ACT 2616.

Please note: this document is intended as a guide only and should not be relied on as legal advice or regarded as a substitute for legal advice in individual cases.