



Australian Government
 Australian Radiation Protection
 and Nuclear Safety Agency

What about base stations and telecommunication towers – are there any health effects?

What does a telecommunications tower do?

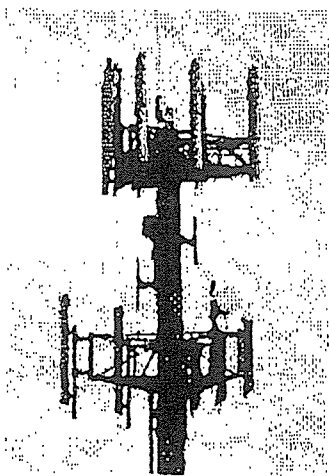
Telecommunications towers support a range of services including mobile phone base stations, and single channel customer connections such as microwave links that support Airservices Australia, Police, Defence, electricity organisations, railways and telecommunications carriers.

The actual structure varies depending on its purpose. For instance a tower can be in the form of a pole, lattice tower or guyed mast. The actual tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes.

What does a mobile phone base station look like?

A mobile phone base station is often a self supporting structure such as a robust concrete pole or a lattice tower that houses a single or multiple antennas. The majority of mobile phone base stations have a number of directional antennas,

which appear as vertically elongated rectangular panels.



These antennas are often located at or near the top of the base station mounted in groups on a triangular or rectangular frame. Each group of antennas services a separate geographic area, known as a cell. The cells operate in conjunction with surrounding cells and towers to create a mobile phone network.

Base stations that service low demand areas can use omnidirectional antennas, which appear as long poles on top of the mast.

Low impact facilities are also base stations but they tend to be panel antennas on rooftops, road signs and building facades.

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

Fact Sheet

EME
 Series
 No. 9

What about base stations and telecommunication towers – are there any health effects?

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What technical requirements do carriers have to meet when siting a mobile phone base station and telecommunications tower?

Telecommunications carriers have a number of requirements to fulfil when selecting a site for mobile phone base stations and telecommunications towers.

Since telecommunications towers transmit radio signals, which travel in straight lines, it is desirable to have a clear path between the transmitter and receiver in order to reduce interference. The higher the tower is sited, the greater the range at which the signal can be received. This is the reason why antennas are placed on hills, buildings and tall structures.

Mobile phones usually transmit to the closest mobile phone base station. Since each base station can only handle a finite number of users at any one time, a tower can become overloaded if there is a high demand for service. An overloaded tower causes users to experience 'drop-out' or poor quality signals. To overcome this problem, additional mobile phone base stations are built to service the extra load. In addition, mobile phone base stations limit their area of coverage by transmitting at lower power, to avoid interference with other mobile phone base stations.

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

Are there any potential health effects?

Mobile phone base stations and telecommunications towers produce weak radiofrequency (RF) electromagnetic energy (EME) exposure levels. The weight of national and international scientific opinion is that there is no substantiated evidence that RF emissions associated with living near a mobile phone base station or telecommunications tower poses a health risk.

Levels of RF EME from mobile phone base stations are well below the limits specified by the Australian Communications and Media Authority (ACMA). In fact, surveys conducted by ARPANSA have found typical exposure levels from mobile phone base stations to be hundreds and sometimes thousands of times below the regulated limit (see <http://www.arpansa.gov.au/Science/rf/index.cfm>).

Health effects that have been shown to result from exposure to high levels of RF EME relate to heating, electrostimulation, and ocular and auditory effects. The ARPANSA Radiation Protection Standard "Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz", which sets public and occupational limits of exposure to RF radiation, is designed to avoid any known adverse effects where people are exposed to RF EME. Compliance with these exposure limits is a condition of radiocommunications licenses issued by ACMA. Such licences authorise the operation of mobile phone base stations.

For further information on potential health effects see fact sheet 1 'Electromagnetic energy and its effects'.

(Revised: July 2012)

Fact Sheet

EME Series No. 9

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Fact sheets in the EME series are:

- Fact sheet 1: *Electromagnetic energy and its effects*
- Fact sheet 2: *Australian Government EME program*
- Fact sheet 3: *The WHO International EMF Project*
- 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>

**Fact
Sheet**

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Network facilities (/Industry/Telco/Infrastructure/Network-facilities)

Mobile phone base stations and EME fact sheet

What is radiofrequency electromagnetic energy?

Radiofrequency electromagnetic energy (EME) is the transfer of energy by radio waves. Mobile phone base stations, broadcast towers and radar facilities all emit radiofrequency EME. EME also occurs naturally and is part of everyday life. Low levels of EME are emitted from natural sources like the sun, the earth and the ionosphere.

Electromagnetic energy (EME) is also known as electromagnetic radiation (EMR).

Are there set limits on exposure to EME in Australia?

The ACMA has made mandatory EME exposure limits for installations such as broadcast towers and mobile phone base stations. The exposure limits set by the ACMA were determined by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) based on recent scientific findings and world's best practice. These limits are many times below a level of exposure to EME that is known to have adverse health effects on the human body and are consistent with World Health Organization guidelines.

The ACMA has adopted a precautionary approach to the regulation of EME, ensuring that exposure limits to emissions from communications transmitters are stringent and lower than those levels that have been found to cause adverse health effects.

Public exposure to emissions from radiocommunications transmitters is generally many times less than the exposure limits required by the standard. ARPANSA conducted audits of base stations between 1997 and 1999, and again in 2003. The results show low EME levels were found in areas accessible to the public.

What action is the Australian Government taking on EME?

Since 1996, the government has provided \$1 million a year for the EME Program. The EME Program supports research into health issues associated with mobile phones, mobile phone base stations and other communications devices and equipment. It also provides information to the public on these issues.

On 1 March 2003, the former ACA introduced a mandatory EME standard, the Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003 (<http://www.comlaw.gov.au/ComLaw/Legislation/LegislativeInstrumentCompilation1.nsf/all/search/064C496C9C/>) which sets new exposure limits. This standard was amended in 2007.

The human exposure standard makes EME exposure limits mandatory for:

- > mobile and portable radiocommunications transmitters supplied for use close to the human body
- > installations such as broadcast towers, mobile base stations and amateur radio stations.

The standard makes mandatory the exposure limits in the Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz (2002) (<http://www.arpana.gov.au/Publications/codes/rps3.cfm>) published by ARPANSA.

An industry code has also been registered by the ACMA that balances the needs of telecommunications carriers with the rights of owners, occupiers and local residents during installation of facilities. The code places minimum obligations on carriers when installing telecommunications facilities.

Registration of the Industry Code C564:2011 Mobile Phone Base Station Deployment (http://www.commsalliance.com.au/data/assets/pdf_file/0018/32634/C564_2011.pdf) means that the ACMA can investigate complaints about breaches of the code and issue a direction to a telecommunications carrier to comply with it.

What action are telecommunications carriers (phone companies) taking about EME?

Communications Alliance Ltd (<http://www.commsalliance.com.au/>), an industry body, developed the Mobile Phone Base Station Deployment Code, which covers the steps telecommunications carriers must take when deciding where to place a facility such as a mobile phone base station.

The aim of the code is to have carriers apply a precautionary approach to the design, operation and selection of sites for communications facilities.

The code also aims to provide increased notification and consultation opportunities to communities and councils about the placement of mobile phone towers and ensure certain EME health and safety information is provided to community members upon request.

Optus, Telstra and Vodafone Hutchison have formed the Mobile Carriers Forum (MCF), with the aim of developing better long-term relationships between telecommunications carriers and their customers, government, industry regulators, councils and the wider community.

More information

More information about EME and health effects is available from:

- > the World Health Organization website at www.who.int (<http://www.who.int>)
- > the fact sheets on the ARPANSA website at www.arpana.gov.au (<http://www.arpana.gov.au>)
- > The ACMA's Radiocommunications Licensing and Assignments Section (<mailto:Licensing@acma.gov.au>).

More information about EME regulations ([/theACMA/mobile-phone-towers-eme](http://www.acma.gov.au/mobile-phone-towers-eme)), including EME human exposure limits, is on the ACMA website.

More information about the *Mobile phone base station deployment code* is on the [EME information portal \(/Industry/Telco/Infrastructure/Network-facilities/human-exposure-to-electromagnetic-energy-eme\)](#) on the ACMA website.

An ACMA fact sheet, *Installation of telecommunications facilities-a guide for consumers*, is on the ACMA website.

Information about the Mobile Carriers Forum is on the MCF website at www.mcf.amta.org.au (<http://www.mcf.amta.org.au>).

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.

Last updated: 11 October 2013

Media Release

Wednesday 28 June 2000

The full report (Levels of radiofrequency radiation from GSM mobile phone base stations) can be downloaded from our website.

Low Emissions from Mobile Phone Towers

Groundbreaking research by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) shows that environmental radiofrequency levels near base stations for the digital mobile phone network are extremely low.

And after taking measurements at base stations around Australia, ARPANSA has found that their emissions were low compared to radio and television signals measured at the same time.

The CEO of ARPANSA, Dr John Loy, said this was one of the first surveys of its kind in the world.

"By finding out if people are actually being exposed to any significant emissions, we can help efforts to assess whether there could be any effect on people's health," Dr Loy said.

"ARPANSA took measurements taken at fourteen digital mobile base stations around Australia and then compared them to the Australian Communications Authority's public exposure limits."

"All of the readings taken showed that there was a significant margin for safety based on those limits."

"The highest daily average level, taking into account the measurements from all sites we surveyed, was ten thousand times lower than the ACA limit"

"Even the highest daily average level recorded for one of the sites was still three thousand times lower than the limit. "

"Given the very low levels recorded and the relatively low power of these types of transmitters, it's highly unlikely that the radiofrequency radiation from base stations would cause any adverse health effects, based on current medical research."

"In most cases, towers used in the measurement program were chosen by local government as sites where local communities had expressed concern."

"Base station signals were monitored over a 24 hour period at each site to ensure that maximum and minimum emission levels were found, as these can vary depending on the level of demand by users in the area."

"Extensive measurements were taken in nearby streets and in places up to two kilometres from each

base station," Dr Loy said.

Although the primary focus of the ARPANSA study was digital mobile phone towers, other communication bands were also monitored as part of the measurement program.

"While measuring the emissions from mobile phone towers, readings were also taken of other communications bands, including paging networks, AM & FM radio, as well as VHF and UHF TV."

"It was interesting to note that the levels of radiofrequency radiation from AM and FM radio or television were significantly higher than those from the base stations," Dr Loy said.

ARPANSA conducted the measurement program at the request of the Commonwealth's Committee on Electromagnetic Energy Public Health Issues (CEMEPHI).

Digital Mobile Phone Base Station Survey Measurement Locations

STATE	LOCATION
NSW	Engadine
NSW	Leichhardt
NT	Rapid Creek
NT	Palmerston
QLD	Nerang
QLD	Kenmore
SA	Repatriation Hospital, Daw Park
SA	Fulham Gardens
TAS	West Riverside, Launceston
TAS	Glenorchy
VIC	Bulleen
VIC	South Melbourne
WA	Jolimont
WA	Carey Park, Bunbury

ENDS