



# Mobile Telephone Communication Antennas and Health Effects

Current research indicates that no adverse health effects should be expected from exposure to the RF radiation from mobile phone base station antennas

There are mobile phone base station antennas on towers and buildings throughout Australia's populated areas. These antennas are part of the mobile (or cellular) telephone network and they emit radiofrequency (RF) radiation. This fact sheet provides information about the possibility of adverse health effects arising from exposure to this radiation.

### Antenna Description and Operation

When a call is made from a mobile telephone, RF signals are transmitted between its antenna and the antenna at a nearby base station. The telephone call is then routed through the telephone network (cable or radio) to the destination telephone.

Mobile telephones emit signals at the frequency of around 800 megahertz (MHz) for the WCDMA (Wideband Code Division Multiple Access) network, 900 & 1800 MHz for the GSM (Global System for Mobile Communication) network, 1800 for the LTE (Long Term Evolution) network and 2100 MHz for the UMTS (Universal Mobile Telecommunications System) network, which is also known as 3G. These signals are picked up by antennas which are on the towers. The signals may also be transmitted between base stations and are in a higher frequency range, 15 to 23 gigahertz, and radiated as a very narrow beam by dish shaped antennas, also mounted near the top of the tower.

### Radiofrequency Radiation

RF radiation, as well as ultraviolet radiation, visible light, infrared radiation and power frequency fields, are types of non-ionising radiation. These radiations, together with ionising electromagnetic radiation (X radiation and gamma radiation) make up the electromagnetic spectrum. See a graphic explaining the electromagnetic spectrum on ARPANSA's website at [www.arpansa.gov.au/pubs/emr/spectrum.pdf](http://www.arpansa.gov.au/pubs/emr/spectrum.pdf).

When ionising radiations collide with biological material, they create positively and negatively charged particles, which may have adverse effects. Non-ionising radiations cannot create



such particles. As far as is currently known, RF radiation, for example, can only cause the molecules in biological material to vibrate and thereby generate heat.

### Exposure Levels and Recommended Limits

The exposure levels of RF radiation are measured in watts per square meter or microwatts per square centimeter (abbreviated as  $\mu\text{W}/\text{cm}^2$ ); one  $\mu\text{W}$  is a millionth of a watt. The maximum exposure levels measured adjacent to the base station towers are less than  $2 \mu\text{W}/\text{cm}^2$ .

These levels can be compared with  $450\text{--}1000 \mu\text{W}/\text{cm}^2$ , which are the exposure limits at the different mobile telephone frequencies for members of the public in the Australian Radiation Protection and Nuclear Safety (ARPANSA) RF Standard (see ARPANSA's website [www.arpansa.gov.au/publications/codes/rps3.cfm](http://www.arpansa.gov.au/publications/codes/rps3.cfm)).

### Health Effects

Current research indicates that, at the exposure levels indicated above, RF radiation is not known to have any adverse health effects.

It is considered that rises in tissue or body temperature of about  $1.0^\circ\text{C}$  or more are required before any adverse effects will occur. In cases of pregnancy, rises in the temperature of the foetus of  $2.5$  to  $5^\circ\text{C}$  are necessary before defects are seen in the newborn. These temperature rises will not occur unless the exposure level is greatly in excess of the ARPANSA RF Standard mentioned above. Exposure to the low level of

RF radiation emitted from base station antennas will not, in fact, cause any noticeable temperature rise.

There are many reports in the literature of research on non-thermal effects, usually of a subjective nature. Studies that have investigated if RF radiation affects biological cells, other than by heating them, are inconclusive. In addition, the exposure levels used in these studies are higher than those mentioned above.

The present concern that people have about RF exposure is whether these non-thermal effects also include cancer. While human studies to assess the possibility that RF

exposure increases the risk of cancer are few in number, laboratory studies do not provide evidence to support the notion that RF fields cause cancer. Review groups evaluating the state of knowledge about possible links between RF exposure and excess risk of cancer have concluded that there is no clear evidence for any links. ARPANSA continues to closely monitor the research being conducted in this field.

## Conclusion

No adverse health effects are expected from continuous exposure to the RF radiation emitted by the antennas on mobile telephone base station towers.