

TETRA

Terrestrial Trunked
Radio



Health+Safety
Information

Published by the TETRA Industry Group

What is TETRA?

→ TETRA is a term used to describe the technology known as Terrestrial Trunked Radio. It is used to provide the resilient, robust, private mobile communications services that are needed by demanding professional users, such as the emergency services, and commercial organisations with mobile workforces or large vehicle fleets. TETRA has characteristics in common with the mobile communications networks most of us use to make calls when we are on the move, but offers additional features to provide secure, reliable and versatile communications. The features include digital call quality, transmission of voice, data and pictures, encryption, direct mode operation to allow local communication groups to be set up, and managed fallback for extra resilience.

Like all wireless systems, TETRA uses radio signals or radio waves in the non-ionising frequency band to provide communications services. Radio waves are part of our everyday lives, and they bring us the benefits of television and radio, and communications on the move. A number of questions have been raised about whether radio waves might have an effect on the health and safety of users or the general public. There is an extensive base of scientific knowledge on the subject and this leaflet sets out to answer some of the questions that have been asked about TETRA health and safety.

TETRA is an international open standard for digital mobile radio communications, developed by the European Telecommunications Standards Institute. It defines a particular way to code radio signals to provide sophisticated mobile communications, including two-way radio, mobile telephony, messaging and data transfer. TETRA networks are working in many parts of the world, including Europe, Asia, Africa and Latin America, serving the critical mobile communications needs of organisations like the emergency services, transport organisations, security organisations and public utilities. A TETRA network operates using terminals and a series of base stations that direct calls to other points on the network. Like other forms of mobile communications, TETRA terminals and base stations use low-powered radio waves - also known as radio-frequency (RF) electromagnetic fields (EMF) - to transmit voice or data content across the network. Unlike cellular phone systems, TETRA also enables rapid communication among a private group of mobile users. This facility is very useful, for example, where a team from the emergency services is working at the site of an incident.



A question of safety

→ A lot of scientific research has been conducted over the last 50 years on radio waves and health. The research has covered a large range of analogue and digital signals, at different frequencies and modulations, including those used by TETRA. This research has been reviewed by many independent scientific expert panels, standards-setting bodies around the world like the National Radiological Protection Board (now part of the Health Protection Agency), government agencies, and health authorities such as the World Health Organisation (WHO). All of them have reached the same general conclusion - that there is no established evidence of any adverse health effects from exposure to radio waves, within the guidelines for exposure to EMF that apply to TETRA and other mobile communications systems.

What the experts say

→ A number of internationally-respected scientists who are experts in the field have reviewed the scientific evidence on whether TETRA could present a potential health risk. Here are some examples of what they have to say...

in general

"nobody has established a medical risk and on balance there is no real reason to worry about TETRA. It is certainly no greater risk than a mobile phone.....the large body of scientific evidence to date indicates that non-ionising radiation does not have any biological effect." - Professor Colin Blakemore, Chief Executive Medical Research Council, who was a member of the Stewart Inquiry and former member of the National Radiological Protection Board (now part of the Health Protection Agency) Advisory Group on Non-Ionising Radiation (AGNIR)

"although areas of uncertainty remain about the biological effects of low level radiation in general, and about modulated signals in particular, current evidence suggests that it is unlikely that the unique features of the TETRA system pose a hazard to health" - National Radiological Protection Board (NRPB)

about base stations

"heating effects from base stations are utterly negligible" - Professor Lawrie Challis, University of Nottingham, Vice Chairman of the Stewart Inquiry, member of the NRPB Advisory Group on Non-Ionising Radiation (AGNIR), and Chairman of the Mobile Telecommunications and Health Research (MTHR) programme

"the RF emission from a TETRA base station is continuous and not pulsed. Measurements show no pulse modulation at 17.6Hz and its harmonics to within experimental error. The changes in RF emission at these frequencies are 1% or less and can all be attributed to limits in the measurement procedure. There are regular interruptions in the streams of digital signals but the average level of RF emission is unchanged" - Professor Lawrie Challis

about TETRA devices

"In applying the cognitive testing regime we had used previously on analogue and GSM phones to TETRA-type phones, with only the 17.65Hz modulation pattern, we were not able to demonstrate any effect on human cognition. The work needs to be repeated with a more complete modulation content, but it does suggest that no specific effects can be attributed to 17.65Hz modulation" - Dr Alan Preece, University of Bristol

"there is a common misconception that heat from TETRA handsets can negatively affect the brain or body when used due to a warming effect. These claims are unrealistic as TETRA handsets emits less than one tenth of the energy needed to raise body temperature by one degree centigrade, and therefore operate many times below the international guidelines on exposure to non-ionising radiation" - Professor Colin Blakemore

The research continues

→ The Home Office has commissioned a programme of studies on the impact of TETRA signals to respond to the eight recommendations in the 2001 AGNIR report. Progress reports are available on the Home Office web site - <http://police.homeoffice.gov.uk/operational-policing/technology-equipment/tetra-terrestrial-radio/>.

A study carried out by the UK Defence Science and Technology Laboratory (DSTL) looked at the impact of TETRA signals on calcium concentrations in neuronal cells. The results were published in the International Journal of Radiation Biology in December 2005. As well as simulating the maximum exposure that can arise from TETRA handsets, several lower power levels were also used to see if there could be "power windows" where TETRA signals cause a reaction. No effects of TETRA on calcium responses were found at any of the power levels used in the measurement.

The DSTL team also investigated the behaviour of calcium ions in heart cell cultures. TETRA had no effect, whereas control tests using pharmacological drugs showed significant effects.

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A further study carried out by DSTL found that TETRA signals had no effects on the performance of volunteers in various cognitive tests. Other cognitive studies are in progress, at the Burden Neurology Institute in Bristol and at King's College in London.

A team at Imperial College London is undertaking a long-term health monitoring study of Airwave police users. The work, which will last for around 15 years, includes a detailed study of a selected group of Airwave users and a long-term follow-up of a cohort of around 100,000 police staff.

The Home Office has commissioned the University of Birmingham and the University of Manchester to look at patterns of work among Airwave users by surveying police staff in urban and rural areas.

The University of Essex is conducting a study of people who perceive that they experience symptoms caused by TETRA base stations.

Safety limits for exposure to radio waves

→ TETRA is subject to the same safety guidelines as other mobile communications products and systems. These are set by independent expert organisations, like the International Commission on Non-Ionising Radiation Protection (ICNIRP). The guidelines, which are endorsed by the WHO and other authorities around the world, set limits for exposure based on extensive reviews of the scientific evidence. The guidelines incorporate a substantial margin of safety, designed to protect both users and the general public. Member companies of the TETRA Industry Group rigorously design and test their products and systems to make sure they comply fully with the safety guidelines.

TETRA terminals

→ All TETRA terminals operate at low power, and work within the ICNIRP safety guidelines. The transmitting power of a TETRA portable radio is comparable to that of a mobile phone, typically 1 Watt at peak power, with average power of 0.25 Watt. TETRA terminals also use a feature called Adaptive Power Control, which continually adjusts the power output to the lowest level needed to maintain reliable communication with the base station.

TETRA base stations

→ The TETRA network relies on a network of base stations, located to ensure complete and reliable communications throughout a geographical area. The base stations are essential to allow organisations like the police, ambulance and fire services, and the construction, security and transport industries, to have reliable and dependable communications wherever they need them.

TETRA base stations are similar to the transmitters used by the mobile phone networks. They operate at low power levels, that are typically hundreds or thousands of times below the safety guidelines set by ICNIRP. The WHO's advice to people who live near base stations is that RF field strengths around base stations are not considered to be a health risk.

Conclusion

→ The members of the TETRA Industry Group welcome the continuing development of better scientific and public understanding of issues related to EMF. The group believes that the extensive body of scientific research which is regularly reviewed by independent expert bodies, and the existence of scientifically-based guidelines for exposure to EMF, provide a sound basis for confidence in the safety of TETRA and other radio technologies.

Where to find out more

→ **Web sites**
If you would like further information about TETRA, please visit our web site: www.tetrahealth.info.

The site contains links to many other useful independent sites including the World Health Organisation, ICNIRP, AGNIR, Independent Expert Group on Mobile Phones (Stewart Inquiry), MTHR, Home Office, The TETRA Association, Mobile Manufacturers' Forum.

For advice on TV interference in the UK visit: www.ofcom.gov.uk.

For general information about electro-magnetic compatibility and interference visit:

- www.mhra.gov.uk/home
- www.intellectuk.org/policy/committees/emc

Leaflets

Other leaflets in this series published by the TETRA Industry Group are available in pdf form from our web site, or from the address below. These include:

- TETRA Base Stations
- TETRA Portable and Mobile Devices
- Science and Standards
- Compatibility & Interference

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The TETRA Industry Group represents Motorola, O2 Airwave, Sepura, London Underground Limited, EADS and The TETRA Association on health and environmental matters in the UK.

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