The Airwave service

- 17Hz

June 2003

Introduction

There have been a number of suggestions that Airwave transmitters pulse at 17Hz and that this could present a health risk. This fact sheet outlines in simple terms the results of independent emission measurements carried out for Airwave, which looked in particular at the 17Hz component of the signal, and briefly outlines the current scientific evidence on 17Hz.

Why is 17Hz an issue?.

Studies carried out in vitro on chick brains in the 1970s suggested that radio frequency emissions amplitude modulated at 16Hz might affect the efflux of calcium in brain cells and therefore have an impact on brain function.

The Stewart Inquiry into mobile telephony which reported in 2001 recommended that, pending further scientific evidence, amplitude modulation around 16 Hz should be avoided in future developments of signal coding.

Recent attempts have been made to replicate the results of the 1970s calcium efflux studies without success. Preliminary results of the latest research conducted by Dr Tattershall of the Defence Science and Technology Laboratories, using a TETRA signal, showed no effects on calcium efflux. Information is available on the Home Office website, www.homeoffice.gov.uk/prcg/tetra.htm.

Work by Dr Alan Preece at the University of Bristol, presented at the Bio-electromagnetics Society Conference in June 2002 found no effects on cognitive brain function. The USAF has done some very high pulse power tests looking at calcium efflux, reported at the Second International Workshop on Biological Effects of Electro Magnetic Emissions in Rhodes in October 2002, and saw no effects.

Professor Lawrie Challis, who was the vice chairman of the Stewart Inquiry, has said publicly that the 16Hz recommendation was not made because it was thought there *was* a health risk; rather it was made in recognition of the existence of the unreplicated research from the 1970s.

Professor Colin Blakemore, who was a member of Stewart Inquiry, has been quoted as saying *"there is a much greater danger to life associated with poor communications than that implied by a questionable investigation suggesting an effect on dead chicken brains that itself is not proven to be harmful."*

Do Airwave transmitters pulse and is there a 17Hz component in the signal?

There is no fundamental 17Hz signal generated by the transmitter. By that, it is meant that the signal is not a wave form which re-occurs 17 times per second

For further information, please contact **Susan Moore** at O2 Airwave on 07764 350834.

The transmitters emit a continuous signal that has steady amplitude, with only minor fluctuations. These are due to the technique used to convey the voice or data information – this technique is called *phase* modulation. So, in laypersons' terms, essentially the signal can be described as 'pretty stable with a small ripple on top'.

To enable each base radio (and there can be between 1 and a maximum of 4 at each transmitter site) to communicate with more than one handset or terminal, it is necessary to synchronise the signal and ensure that individual messages do not get muddled up during transmission. This is done by sending additional timing information with the voice or data message being transmitted. It is the phase modulation of this timing information that creates a very tiny 17.65 Hz component (along with components at 35.29Hz, 52.94Hz and 70.59Hz). The 17Hz component can be seen only when the signal is demodulated using very sensitive equipment.

The National Radiological Protection Board reported on this issue in November 2001 and concluded: "*The measurements confirm that, to within the limitations of the measurement technique (less than 1%), TETRA base station signals are continuous and not pulsed over time intervals that could cause amplitude and therefore power modulation at frequencies between 1 and 200Hz*." Further information is available on the NRPB's web site www.nrpb.org/publications/documents of nrpb/abstracts

Professor Lawrie Challis has said "*emissions from TETRA base stations are not pulsed and there is no reason to suppose that TETRA base stations have characteristics any different from mobile base stations in general*" and also that there is "*no evidence that 17.65Hz has an effect nor any [biological] mechanisms which exist to suggest it should.*"

What is the strength of the 17Hz component and how does it compare with safety guidelines?

The transmitter operates at very low power overall, Each base radio emits 25 watts so a site with the maximum of four base station radios would be emitting 100 watts – equivalent to a household light bulb. The 17Hz component is so small – much less than half a percent of the total emission - that it is around 8 million times below the ICNIRP public threshold when standing 50m away from the base of the transmitter.

The ICNIRP guidelines are set by a group of international scientists, independent of Governments and industry, and are reviewed regularly. Some concerns have been expressed that the ICNIRP standards take account only of thermal (heating) effects. This is not true; their most recent review looked at all the scientific evidence on thermal and non-thermal effects. They specifically looked at whether there was any scientific evidence of possible biological effects which would lead to any health hazards and merit a change to the guidelines. They concluded that there was no such evidence and hence that no change was required.

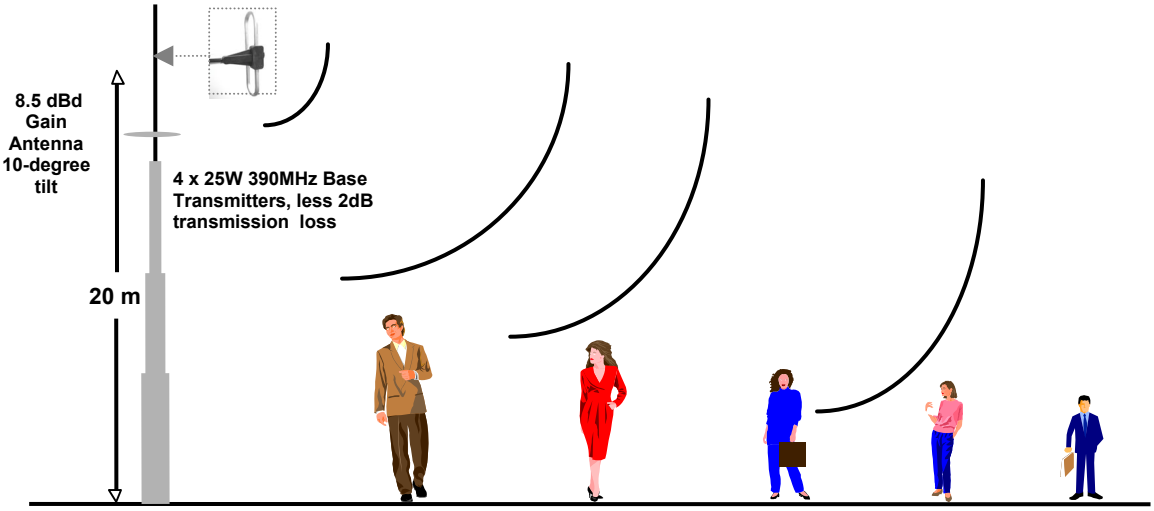
The ICNIRP safety guidelines were set on the basis of the results of the many different research studies into non-ionising radiation and incorporate a substantial margin of safety.. Details of the research can be found within the documentation of the guidelines at http://www.icnirp.de/documents/emfgdl.pdf

The ICNIRP occupational exposure standard is set 10 times below the safety threshold, and the ICNIRP standard for public exposure is even more stringent, being set 50 times

below the threshold. So the standards have substantial margins of safety built in and are themselves set on a precautionary basis – the move from NRPB to ICNIRP standards was in fact a key element of the precautionary approach recommended by the Stewart Report.

At a typical Airwave transmitter site with the maximum four base radios in operation, the pattern of emissions can be illustrated by the diagram below:

Typical TETRA Transmitter Site - Calculated Ground Level Exposures



Distance from tower	3 m	10 m	50 m	100 m	300 m
Number of times overall emissions are below ICNIRP safety standards	525	1,015	1,370	365	5,700
No of times 17.6 Hz component Is below ICNIRP safety standards	3 million	6 million	8 million	2 million	35 million

For example, standing 50m from the base of the transmitter, the emissions overall are over 1000 times below the ICNIRP guideline, which is equivalent to 50,000 times below the threshold The 17Hz component of the signal is over 8 million times below the safety guideline.

An analogy for thinking about the level of the 17Hz component relative to the overall signal - which is itself low powered - might be to imagine observing a continuous beam of light as strong as that emitted by a source like a lighthouse, and then imagine someone standing next to the beam waving a piece of paper in and out of the beam 17 times a second – an observer would not be able to detect any variation.

In conclusion

There is no evidence that radio frequency emissions at 17Hz are damaging to health. Various reports by leading scientists have been published casting doubt on the methodology of the 30 year old experiments which postulated this, and the results have not been replicated despite a number of attempts. Preliminary results of work in 2002 by Defence Science and Technology Laboratories has found no effect on calcium efflux.

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Airwave accepts that, because science cannot prove a negative, there is likely to be continuing public concern about radio frequency emissions, whether at 17Hz or other frequencies.

The 17Hz component emitted by an Airwave transmitter is absolutely tiny – less than a millionth of what would be permitted by the ICNIRP safety guidelines for the general public.

By any stretch of the imagination it is hard to see how such an infinitesimally small component from a low powered transmitter would be discernable by the human brain, particularly given the overall mix of much stronger radio emissions all around us, which originate from a multiplicity of other sources, including mobile phone handsets, hairdryers, personal computers, microwave ovens, TV transmitters, baby alarms and so on.

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