NEW DIGITAL TRANSMISSION TECHNOLOGIES - THE EMC CONUNDRUM

1 INTRODUCTION

The growth of our 'cordless' society has placed a premium on personal mobility. In the telecommunications sector the growth in the use of cordless telephones and cellular radios has been spectacular. To provide for this growth, in an age where frequency spectrum is similarly in demand, has required the development of new technologies.

2 RADIO TECHNOLOGIES

Recent developments in radio in Europe and worldwide have selected 'time division multiple access' (TDMA) technologies for assigning channels to individual radio users. The traditional frequency division multiple access (FDMA), mainly analogue, techniques are still used extensively but are slowly being replaced by digital TDMA systems, which offer both improved performance and spectral efficiency, particularly in large 'public systems'.

3 WANTED RF EMISSION

In a TDMA system the 'channel' used by an individual represents one time slot from say 10, allocated to that user normally at a sub-audio rate, for example, 200Hz.

The resultant effect is that a burst of RF is transmitted at that sub-audio rate, in the example above the RF burst would last for 5 msec and be repeated every 50 msec. The 5msec RF burst would contain the transmitted information at a rate 10 times faster than the basic rate to provide a continuous transmission for the user.

The RF signal described above is amplitude modulated (AM), in this case at 200Hz, this AM is in addition to the modulation contained within the RF burst itself. Tests to date have shown that many radio and non-radio (particularly audio products) are susceptible to an RF signal with these characteristics.

The growth of cordless telephones and personal communications equipment also means that the transmitter will be physically much closer to potentially susceptible equipment.

4 EMC DIRECTIVE AND LEGISLATIVE PROVISION

The Community's EMC Directive requires that all electrical/electronic equipment neither emit nor radiate unwanted RF signals, and not be susceptible to other (wanted) RF signals, ie legitimate radio transmissions.

Legitimate radio transmissions are licensed in the UK by the Radiocommunications Agency of DTI, under the 'Wireless Telegraphy' Acts. The licence provision includes the frequency, form of modulation, permitted power level and

controls spurious and other parameters by only licensing equipment approved to definitive standards of performance.

The EMC Directive will come into force on 1 January 1992; it offers the power to control, from that date, equipment 'placed on the market' and will require compliance with essential immunity' standards.

The pan-European digital cellular radio system - GSM - which is also supported by a Community Directive, should become operational at a similar date. The WT Act licence offers the potential to control the power levels of GSM equipment.

5 THE CONUNDRUM

The 'generic' immunity standard being set by CENELEC has been currently agreed to be set at '3 volts per metre'

The immunity standard necessary to avoid interference from a GSM equipment will need to be in the range '10 volts per metre' to '20 volts per metre' if the current power levels of GSM equipments are to be maintained. It is, of course, subject to the distance between the GSM transmitter and the target device being defined.

The obvious incompatibility and potential hazard to 'safety related' or 'pseudo-medical' applications eg hearing aids, provides the conundrum.

6 DISCUSSION

Scant regard, has in the past been paid to the design of equipment with realistic immunity standards - particularly in the domestic market. The EMC Directive provides the legislative framework to correct this deficiency. The 'generic' immunity standard of '3 volts per metre' has been pitched at a level that most equipment designs already meet and thus provides little or no real improvement. A more realistic figure would be '10 volts per metre'.

The adoption of TDMA technology, with its inherent advantages is more intrusive, in EMC terms, than previous FDMA technologies. This is particularly true of 'audio' equipments such as personal stereos, which have a high probability of being in close proximity to the new digital radio telephones.

It could be argued that the AM component of the TDMA transmission is also 'unwanted' and hence covered by the EMC Directive; this view is not shared by the spectrum managers, where it seen as a legitimate and efficient transmission.

The spectrum manager has the option of defining the maximum radiated power, to a level compatible with realistic immunity standards.

7 CONCLUSION

A compromise between 'immunity' standards for all radio and non-radio equipments, coupled with a limitation of radiated power from, particularly hand held TDMA transmitters, will be essential to avoid unwanted EMC problems. The attached Annex proposes a scenario for discussion purposes.

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ANNEX

EMC CONSIDERATIONS

1 **Assumptions:**

- the minimal distance between a radio transmitter and a target radio or non-radio equipment shall be 1 metre;

- safety conscious and pseudo medical systems shall have higher immunity standards than the 'generic' standard level.

2 **Proposes that:**

- generic immunity standards for all equipment be set at 10 volts per metre minimum;

- sectorial immunity standards for body worn audio equipments be set at 15 volts per metre minimum;

- sectorial immunity standards for any 'safety conscious' system be set at 25 volts per metre minimum.

3 **Transmitters using AM or TDMA technologies be limited in radiated power to:**

- hand held devices - 1 watt peak power;

- vehicle mounted equipment, where the antenna is at a minimum height of 1.5m, located at least 0.75m from the vehicle's outline - 5 watt peak power.